DISTRIBUTION OF LANDHOLDINGS AND AGRICULTURAL PRODUCTIVITY IN ALIGARH DISTRICT

DISSERTATION

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CERTIFICATE

This is to certify that Mr. Md. Ashbabul Hoque has completed his dissertation for the award of the degree of M.Phil entitled "Distribution of landholdings and Agricultural productivity in Aligarh District" under my supervision. He is allowed to submit the work for the award of the degree of M.Phil.

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Prof.(Mrs.)Abha Lakshmi Singh
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Md. Ashbabul Hoque

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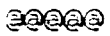
C O N T E N T S



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G L O S S A R Y

Local Name	Common and/or Botanical Names
Arhar	Pigeon pea or redgram : Cajanus Cajan
Bajra	Pearl millet : Pennisetum lyphoideum
Bhangar	Old alluvium
Bhur	Light soil;
Banjar	Cultivable wasteland;
Block	Administrative division of tahsil;
Dhaincha	A green manuring crop; Sesbania aculeata
Doab	Inter-riverine plain;
Jhil	Small lake;
Jowar	Great millet; Sorghum vulgare
Kankar	Calcium nodules;
Khadar	New alluvium;
Kharif	Rainy season crop (Mid June to Oct.)
Nadi	River
Nala	I- A season stream II - An artificial drainage line;
Rabi	Season of winter crop (Nov. to March);
Reh	Saline soils, salt enflorescence;
Sankhiyaki Patrika	Statistical Bulletin
Tahsil	Administrative division of district
Usar	Saline-alkali and alkali soils;

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I N T R O D U C T I O N

INTRODUCTION

'Landholding' refers the size of holding under one ownership. productivity is defined as the output per unit of input or per unit area. The size of landholding is very important in economic, agricultural geography and it also plays a vital role in regional planning. In agriculture optimum size of landholding under given conditions would provide the best yields to the farmers and it influence the efficiency of agricultural production. Degree of commercialization, mechanization of agriculture, methods of farming, intensity of agriculture, cropping pattern, development of minor irrigation and living standard of the farmers - to a large extent are the function of landholdings. Similarly agricultural productivity tells about the quality of soils, qualitative aspect of labours, economic status of the farmers, economic conditions or economic stability of any region or country. It fulfils the food demand of the people. It also provides an idea whether the farmers adopted modern agricultural inputs or they are cultivating their lands with traditional bound technology. It also determine the technical and cultural power of the farmers.

Aligarh district of western Uttar Pradesh has been chosen as the study area because Intensive Agricultural Development programme was introduced in this district in early sixties. It is most prosperous and agriculturally advanced

district. This district is noted for its agricultural diversity. The main crops are wheat, barley, maize, rice and oilseeds. Regarding the distribution of land holdings it was observed that in the study area about 26.54 percent were large farmers, 22.57 percent medium, 15.98 percent semi-medium, 20.95 percent small and 13.98 percent marginal farmers. The average size of landholding in Aligarh district was 1.42 hectares (1991-92).

In this study an attempt is made to see the distribution of landholdings and to assess the impact of landholding on agricultural productivity. The country's average holding size has gradually declined and the number of small and marginal farms have increased.For example, in Uttar Pradesh about 75 percent of the total landholdings are less than one hectare and only 4 percent are above 4 hectares. So it is necessary to examine the profit, the farmers are getting from their lands.

OBJECTIVES :

The objectives of this study are :

1. To study the physical feature, drainage, climate and soils and how these have influenced the development of agriculture
2. To study the distribution of landholdings.
3. To assess the general aspects of the sampled farms like

their number, total family members, literacy and educational status.

4. To assess the agricultural background of the sampled farms belonging to the different categories like total number of landholdings, their average size, total cultivated area, intensity of cultivation, number of family members engaged in agriculture etc.

5. To assess the agricultural inputs used in the various type of sampled farms like irrigation, fertilizer, HYVS, improved agricultural implements insecticides and pesticides and labour.

6. To assess the yield, production and input-output balance in the various type of sampled farms.

7. To assess the relationship land holdings and agricultural productivity.

DATA BASE

The study is based on both primary and secondary data. The primary data regarding the size of holdings, agricultural inputs used, cost of various inputs, yield of crops etc. were collected through intensive field works on the basis of questionnaire and interview of the farmers. The secondary data regarding area, production. Yield, number of agricultural implements, irrigation, fertilizer etc. were taken from,

1. Census District Handbook (Aligarh) (from 1961 to 1991) published from Allahabad.
2. Sankhiyaki Patrika Aligarh district (from 1961 to 1993) published from the District statistical office, Aligarh.

METHODOLOGY :

The analysis is based on sample desing. Villages from study area were selected randomly from every block of the district. The study area consists of 17 blocks and 2 villages from each block were selected and surveyed. Hence, a total of 34 villages were surveyed. From every village 10 farms having different size of holdings were selected.Thus, 340 farms having different size of landholdings (Large farms-having more than 10 hectares of land, medium having 4-10 hec, semi-medium 2-4 hec, small 1-2 hec. and marginal farms having less than 1 hectare of land) were surveyed.

In order to establish a relationship between landholdings and agricultural productivity in the study area qualitative and least square fitting methods have been used.

The present study is divided into two parts, Part one is the nature of the problem and part two is the investigation and results. Part one consists of three

chapters. Chapter one deals with the meaning, size, measurement, fragmentations and causes for small size of landholdings. Chapter two deals with the concept, measurement and causes for low productivity. It also deals with relationship between landholdings and agricultural productivity. Chapter three is devoted to the review of literature.

Part two consists of two chapters, Chapter four deals with the study area-Aligarh district, physical environment, human environment and Agricultural background were studied. The Human environment deals with the distribution, density and growth of population, economic classification and occupational structure of population, and distribution of landholdings. In agricultural background area under cultivation, types of cropping season and types of crops grown, adoption of technology production and yield of different crops has been discussed. Chapter five is devoted to assess the distribution of landholdings and agricultural productivity in study area. The general aspects of farms, agricultural background, agricultural inputs used, production and relationship between landholdings and agricultural productivity in the sampled farms has been discussed. A brief conclusion is presented on the basis of investigations and results.

CHAPTER - ONE

The various aspects of the size of land holding has been discussed by many scholars in accordance with the influence on the efficiency of agricultural production as well as its distribution.The size of land holding has charged over a long period of time. This subject has attracted students of agricultural history of the world. This has angle importance in different sectors such as industry, agriculture and in planning.

In manufacturing industries the size of holding plays a very important role because the existence of any industry largely depends on the optimum size of farm which generally means a size in existing conditions suited in applying technique and organising, ability through the lowest average cost of production per unit. While in agriculture the optimum size of holding under given conditions would provide the best yields to the farmers."Poverty in agriculture in most of the Third World Countries is as much a problem of farm size as of any other single factor. The great majority of farm families in these developing countries with low incomes, live on undersized and inadequate units. Since the amount of income is dependent on the size of the farm, proponderance of small and tiny holdings is mainly responsible for poor peasantry in these countries. Even where there are no cost advantages or disadvantages for farms of various sizes, small farms will have, under usual

usual price relationship. Low incomes and hence savings than large farms. Thus, size of farm is a vital element in determining the earning capacity of the farmer as well as the efficiency of a farm unit" (Sadhu and Singh, 1989). It also determines degree of commercialization, mechanization of agriculture, methods of farming, intensity of agriculture, cropping pattern, development of minor irrigation and living standard of the farmers (Singh, J. 1988).

1.1. MEANING OF THE TERM LAND HOLDING :

Land holding refers to the size of holdings under one ownership. A landholding is defined as the aggregate area of land operated by an individual farmer with or without assistance of others regardless of location, size or title and using whole or part of the command agricultural lands and the same is defined in terms of cultivated area only. The owned land, on the other hand, is defined in the survey as the aggregate of agricultural land (excluding homestead) owned spearately by an individual and his dependent irrespective of location, source of ownership and its full or partial utilization for agricultural production (Census of India, 1961).

"....A holding or farm, for census purposes is land that is used wholly or partly for agricultural production and is operated, directed or managed by one person alone

or with the assistance of others, with regard to title, size or location. It may consist of two or more pareds of land, even if widely separated provided that they form part of the same technical and economic unit" (F.A.O., 1950). This definition has problems of interpretation in some parts of Africa for communal farming it is difficult to distinguish separate holdings. The application of this definition is also difficult in Eastern Europe and China because agriculture is done by state farm and collective farm from a number of farms grouped in a co-operative.

Another problem appears particularly in large state which is divided up into small tenant farms. If the Landlord or his manager provides capital and other facilities to the tenants. Then whether the tenants should be considered as farmers or considered a part of unit of operation.

Another problem is that some countries collect data on all agricultural holdings while few countries exclude a holding size of less than one hectare. This is found in England and Wales and also in U.S.A. But in Japan size of holding is very small at a greater proportion. So no comparison is made between England and Japan.

The other complicated problems arise in response to size of holding what acreage is to be returned for a building in an area where shifting cultivation is prectised? Is grazing

land which is owned communally to be excluded of allocated among all the farmers who utilize it? Should wood land used for forestry be excluded? (Grigg, 1966). Besides, there are so many problems and thus, no comparison is made between countries. The land holding is further classified as total area and restricted area, which in many cases implies agricultural land. Despite there are a number of anomalies. The very high proportion of larger holdings in Austria would seem to be due to there inclusion of holdings which are mostly devoted to forestry. In Mexico, the importance of very large holdings is exaggerated because unproductive land has been included in the returns of private holdings (F.A.O. 1961).

1.1.1 Operational Holdings :

Which generally means the actual area is being operated by farmers. Operational holding includes :

i) Number of active agricultural workers per unit of agricultural land.

ii) Number of draught animals per unit of cultivated land.

iii) Number of tractors, harvestors etc. per unit of cultivated land.

iv) Consumption of chemical fertilizers; NPK per hectare of cultivated land.

v) Irrigated land as a percentage of total cultivated land.

vi) Harvested land as a percentage of all anable land (including fallow).

vii) Livestock units per unit or agricultural land.

Operational holding provides a clear picture at a state or macrolevel, but due to fragmentation of land and ownership of land holding it becomes very complex at a lower or microlevel.

Afterall, operational holding generally refers to allow decision making about land in response to past experiences, current prices, irrigation facilities, fertilizers and climatic conditions all these factors determine how the land is to be used in the forthcoming cropping at the lowest level.

The operational holdings have been classified on the basis of area covered and areax operated. Thus, operational holdings have been grouped under five categories;

i) Marginal holdings - which having an operated area less than one hectare.

ii) Small holdings - having one to two (1-2 hec) hectares of land.

iii) Semi-medium holdings - comprising of two to four (2-4 hec) hectares of land.

iv) Medium holdings with a size of four to ten (4-10 hec) hectares of land.

v) Large holdings having more than ten (10 and above) hectares of land.

Table 1.1 is showing the number of operational holdings and area operated by size classes in India.

1.1.2 Economic Holding :

Which generally provides full employment to the farmer's family and supports him to acquire a reasonable standard of living and it also focusses attention upon full utilization of given resources of farmer's.

1.1.3 Optimum Holding :

It is seen that when the size of holding becomes too large, there is a problem of supervision as well as managerial. Similarly the very small size of holding is not suitable to allow modern agricultural implements. Hence, there is a need to have proper size of holding which yields maximum return to the farmers and ensures minimum cost it is called optimum sized holding.

Optimum size of holding refers to the maximum size of farm which a family should possess and which allows most efficient use of resources (land, capital, labour) in agriculture (Sadhu and Singh, 1986). It is also defined as

Table 1.1 : Number of operational Holdings and Area operated by Size classes in India (1985-86).

Category of land holding	No. of holdings (million)	Percentage	Total area operated (million hec)	Percentage	Average area operated per holding (hec)
1	2	3	4	5	6
Marginal (below 1 hec)	56.8	58.1	21.6	13.2	0.4
Small (1-2 hec)	17.9	18.3	25.5	15.6	1.4
Semi medium (2-4 hec)	13.3	13.6	36.6	22.3	2.8
Medium (4-10 hec)	7.9	8.1	47.0	28.7	5.9
Large (10 and above)	1.9	2.0	33.2	20.2	17.2
Total	97.8	100.0	163.9	100.0	1.7

Source : Kurian, N.J. (1990) : "Employment potential in Rural India", Economic and Political Weekly, December 29, Tables 1,2 and 3. P. 179.

"ought to be large enough to occupy the reasonable working time of the farmer and his family where they use the best and most efficient tools and machinery known to the farming world (Sadhu and Singh, 1986).But optimum size of holding differs according to crop type, nature of the soil, ability of the farmers, methods of production used and other factors. "while there is no one proper size for farms in general, there is no one proper size for farms in general, there is always a proper size of farm for a given stage of his own development, on a given type of soil, in a given line of production, with a given labour and market can conditions" (Sadhu and Singh; 1986).

The optimum size of holding is not fixed, it is changing depending upon technique, knowledge, improvement of market, organizational ability, cheap labour force and capital facilities. So it is essential to make all the farm size approximately to the optimum size. But in India the size of holdings are below the optimum size. There are three causes such as technical, financial, social and legal-which interrupt to expand the farm size upto the optimum.

1.2 MEASUREMENT OF HOLDINGS :

Basically the size of holding is measured by land area (acres or hectares). But in U.S.A.size of holding is measured by using the amount of capital invested in land,

buildings, labour, machinery, equipment, crops and livestocks (Gregor, 1982a). Similar notions were introduced in U.S.A. by Smith, 1980; who identified the richest farms and ranches. It is measured by employing values of farm sales (Windhorst, 1989). Today output of the farm is measured by the amount of labour (Standard man days - SMDS) or by gross margins (European size units - ESUS). In U.K. full time farm is defined as creating more than 250 SMDs of Labour requirement each year. In India, the size of holdings can be measured in terms of acreage or hectare. "The great merit of this measurement is that it cannot be conceded and is also free from annual fluctuations and changes in compositions" (Khusro, 1973).This measure of holding failed to differentiate between two area with dissimilar system of farming. For example, the equal size of holding which is found in Rajasthan, is less productive and which is found in Punjab or western Uttar Pradesh, is more productive.

The other measurement of size of holding is man-work unit which envisages the amount of work to raise the crops and livestock. But labour employed differs in terms of quality and productiveness.

Another measure of landholding size is total capital employed on the holding and it is determined by adding all the cost values of inputs viz land machinery, livestock,feed, fertilizers etc. But this measurement is also unsatisfactory

because of its areal variations. Another measurement of farm size is the volume of gross output. But it does not take into account soil and weather variability, shifting of farm price results in changing of volume of gross output from year to year.

On the whole, the size of landholding is measured by area size of farm in terms of acreage or hectare and which is internationally accepted after devoiding its limitations.

1.2.1 Farm-size structure :

As the farm size structure varies from country to country, there has developed a number of theories to account for such variations by many eminent scholars. The farm size structure is based on farm population density, stage of economic development and level of agricultural capitalization (Huang, 1973).There is great influence of the productivity of the resource base, inheritance laws and the role of state on farm size structure (Grigg, 1966).

As the 'farm population density' increases, the land-holding is divided and sub-divided into smaller farm units. Thus, a comparison is made between large farm structure of 'Land rich' countries (Canada, Australia) and small farm structure of 'Land Scarce' countries (Norway, Italy,Greece). A historic relationship between farm population density and

farm size can be observed at the regional and international level.

As the 'level of economic development' increases due to capitalist market relations, the factors of production are transferred into the industrial sector from the farm sector.

The productivity of resource base (soil, climate and topography) also affects the variations in farm-size. It has been found that farm inputs on less productive land have to be increased greater than more productive land to get comparable output. So poorland with low inputs yield low output per hectare and more productive land with higher level of inputs yield higher output per hectare.

Proximity to urban areas influences the farm size structure' at local level because of local advantages in terms of marketing facilities and inputs. Small farms near to prban areas achieve equal profits with that of large farms at a greater distance. However, farms near to urban areas face problems such as fragmentation because of urban infrastructure viz roads, canals and railways.

'The role of the state' appears to be significant in explaining variations in farm size structure' at national context. The state can establish a law for land inheritance.

The state can also sponsor land reform policy either in breaking up of large land or creation of large land or collective farms.

1.2.2 Farm-size Differences :

The size of farm are unevenly distributed or distributed in a quite random manner within a country or there are marked regional differences in farm-size, for example large farm size concentrates in northern India whereas small and medium sized farms predominates in western, southern and eastern India. There is a geographical difference in farm-size. The average size of farm in Europe is about 8 hectares, in South America it is 96 hectares and in Australia the average holding size is about 1,137 hectares (F.A.O., 1961). while in India it is about 1.7 hectares. The factors which are related to landholding size are population density, land use and topography.

There are many methodological and statistical difficulties to analyse their size of landholding. First problem is that many countries dnnot survey or donot make available statistics on the land holding size. These countries are basically informed by other countries. Second difficulty concerns with the changes of land holding sizes which have been taken place since fifty's. The changes include bulk of the data, land reform measurement in many countries and which affected

land ownership and ultimately altered land holding size. Third problem in response to landholding size is that the statistics are not directly comparable. In other words there is a variation in the meaning of land holding size and what area is to be included within a size of land holding.

The farm-size differences is generally represented by considering the average size of farm or holding.But it has some limitations....." To ask what the average size of farm is for the country as a whole is as absured as to enquire" (Hill-P. 1962). If this concept of farm of an area is applied, there is a need to make some differences. First, differences between countries in terms of 'holding' and agricultural land' which affect the average size of holding. Secondly, there may be sharp internal differences within a country in the average size of farm. Thirdly, in many countries where there are a large number of very small farms which occupy a small proportion of the total area; again the average size of farm may be misleading (Grigg, 1966). In some countries available data are estimates of the average size of farm whereas many countries have more detailed statistics which provide the number of farms in specified size groups, such data can be compared most easily by repreeenting each size group as a percentage of the total and the figures can then be presented graphically or in the form of tables (F.A.O. (1961).

It is necessary to study the average size of land holding of the world as to know the arable land per capita of farm population. The average farm size is low throughout the Far East but it rises above 5 hectares in Srilanka. The lowest average size of holding is to be found in Japan, Korea, China, Taiwan and Java, Whereas in South-east Asia. The average size of holding is slightly higher but most of the holding is of small size. The small size of land holding occupies the bulk of agricultural land in Japan and Java (below 1 hectare), while in Thailand, philippines, Cambodia and Vietnam - a sizeable portion occupies on area of five hectares. The causes of small size of land holding is the dense and rapidly growing farm population, inheritance law through which farm is to be divided among all the sons as well as daughters.

In Europe, the average size of holding is above 20 hectares (except Great Britain). But the average size of holding in Mediterranean and in South eastern Europe is very small. In Central and Eastern Europe, the average size of farm is about 10 hectares while in France, British Isle it is above 10 hectares.

The farm size in Africa is very small with the exception of European farms (in Africa). In Nigeria, Ghana where average size is 1 to 1.5 hectares, though the average size is higher in some parts of East Africa. In Africa, agriculture is done

by family, not by individual. They do not have any modern tools. It is very difficult to cultivate large area with hoe and cutlass. The size of land holding in European colonies is higher than the average African holding.

The average size of holding is higher in Middle-East In Turkey, the average farm size is small, in Egypt small farm size is found elsewhere in Asia. In Israel,Jordan, Iraq and Syria the average size of holding is much larger and which is comparable with western Europe or Central America. In Syria, Iran andIraq where landowner's estates are divided up into many small farms which are of great importance. In Jordan, agriculture is traditionally practised on small and medium holdings. Afterall, most of the middle East is arid and where rainfall is lower; so the size of land holding is larger particularly in Syria, northern Iraq, east of Jordan and Western Egypt.

In North America, the average size of farm is about 87 hectares especially in the U.S.A. In South America, the average size of holding is about 199 hectares. In caribbean island, the average size is low but in north and south caribbean island, the average size of farm increases sharply. This existence of large size farm is due to low population density.

The average size of holding in Australia and Newzealand

is remarkably high and where man/land ratio is more favourable than in many parts of the world and the predominant type of farming, pastoralism and extensive wheat growing would lead us to expect very large holdings (Grigg,1966). In Newzealand 70 percent of all farms are less than 100 hectares and occupy 12 percent of the land but in Australia the same size groups are 37 percent of the total number and occupy 1 percent of the land (Crawford, 1952).

1.2.3 Type of farming and Farm :

'The size of production unit is often closely related to the type and intensity of land use' (Sir Binns, 1955). This clearly indicates that large holding is predominated by grain production and sheep rearing whereas flowers or vegetables are carriedout on small holdings. But this is not true in all cases. Recently it has been seen that grain production as well as sheep rearing predominates on small holdings and market gardening on large holdings. This type of relationship depends on different environmental and economic conditions in different parts of the world.

i) Environment and Land holding :

Generally it is said that low productivity land is the outcome of low rainfall and poor soil requires large holdings while high productivity lands necessitate small holdings because of fertile soil. In this regard some environmental

conditions have to be mentioned. Such as landholdings are large in arid regions and small in humid regions. But this type of relationship is not always true. In England and Wales where holdings are small and agricultural productivity declines westward. In northern Iraq where dry farming is practised on large holdings but productivity is less than the irrigated lands of southern Iraq. In both cases land tenure and settlement history is the main factor rather than environment.

In Newsealand smaller holdings are on the plain and large holdings are on the upland areas; in Australia larger holdings are on the upland areas and smaller holdings are on the low land areas. In U.S.A. larger farm sizes are on the fertile land and smaller in the least fertile land. Thus, there is no hard and fast rule about the importance of environment in drtermining farm size.

ii) Economic factors :

There are certain economic factors namely capital and location which influences the size of holdings. It is generally said that "smaller farms may be labour intensive or capital intensive. It does not follow that the farmers with greater capital will necessarily occupy larger farms, but shortage of capital may well help limit the size of farms" (Jacoby, 1953). In Africa, the size of farm is the function

of family size, labour force and agricultural implements. As far as location is concerned, it is noticed that farms near large urban areas tend to be smaller than those farther away; But this notion varies with respect to space. It has been pointed out that small farms in England could survive near to markets where there was a sale for garden produce and at great distance from urban areas, opportunities for employment other than in agriculture decline. Therefore, population pressure keeps farms small. Similar phenomenon exists in many mountain communities. A high rent and farming intensity in the vicinity of urban areas leads to small sized farms. (Craigie, 1887).

1.3 THE CAUSES OF VARIATIONS IN SIZE OF LANDHOLDINGS :

Although some of the factors have been discussed previously but there are other causes which suggest some explanations of regional differences in the size of land holdings. Some of the important causes are given below;

i) Population pressure :

The most important factor which relates to land-holding size is the population/land ratio. It is urged that farms seem to be small where there is a shortage of agricultural land and large where there is a relative abundance. Thus, it is commented on the differences between Europe and Asia with dense population and a small amount of land per capita, and the America's, Australia and the European holdings

in Africa where settlement is more recent and there is a more favourable man/land ratio (Venn, 1933, F.A.O. 1961). It is practically tested that all countries with a very small average size of holding had a very high population density and that very large average size of holdings are found only in countries with very low population densities (F.A.O. 1961).Thus, it is assumed that rapid growth of population and little opportunity of alternative employment in non-agricultural sector lead to the sub-division of land holdings and there is a decrease of average size of farms. In a few countries, namely, England and parts of France where rural population migrated to urban areas, has led to decline in rural population and hence there is an increase in the average size of land holding, on small sized farms, farmers are attached to the land and worked on land efficiently other than industry, while there is far less attachment to the land and movement towards the industrial ☒ areas will be more rapid, both the opportunity and the necessity for large farm is greater. Thus, population growth or pressure is important in determining regional differenees in landholdings.

ii) Law of inheritance :

In some countries of the world where equal division is common after the death of land owner's.The land is divided among all the sons, even between the sons and daughter Equal division is seem to be practised in Europe where legal

systems have been influenced by Roman Law or the code Napoleon; in Muslim countries equal division applies, as it did in pre-communist China and countries where Bhuddist and Hindu Law prevail, (Yates, P.L., 1940). Thus, law of inheritance creates differences in farm size and leads to a fragmentation of very large holding to small holding. Therefore, almost in every country, it seems that there is a decline of very large holding into small holding.

iii) The role of the state :

The intervention of state (with exception of the Socialist states) is relatively minor in importance to the agrarian structure. In Europe, there are many small Land holdings and legislation has attempted to prevent further sub-division of land but in Asia, there are many uneconomic holdings and legislation has attempted to prevent amalgation of holdings and redistributed the land among landless Labourers. In U.S.A., Australia and Newzealand the state has played a more active part in determining the size of holding.The state allocates block of lands to the farmers and which influence on farm size.

1.3.1 Causes for small size of land holdings in India :

Though, the agriculture is the mainstay of the people of India where 70 percent people depend on agriculture. But large number of Indian farmers possess small size of holdings.

It is found that more than half of the total operational holdings in India are either sub-marginal (below 0.5 hec) or marginal (0.5 to 1.0 hec). The main causes are :

i) Rapid growth of population :

The accelerating growth of population has put enormous pressure on the limited land and the land gets divided and sub-divided leading to small size of holding.

ii) The Law of inheritance of ancestral property :

According to law either Hindu or Muslims or others the land is divided among sons and daughters after the death of parents and hence, the landholdings become smaller in size.

iii) Decline of Joint family system :

In joint family system, the whole land was held together and all the agricultural operations were carried on jointly. But Joint family system has broken down under the impact of industrialization, growth of towns and spread of western culture. As a result the number of small holdings have increased.

iv) Decline of handicrafts and village industries :

The handicrafts as well as village industries (small industries) have provided employment, livelihood and economic stability particularly among the villagers. But Indian

Indian handicrafts faced stiff competition with machine made goods, "The British occupation slowly changed the professional system, ruining the overtaxed peasants, developing exchange and monetary economy reducing millions of craftsmen to poverty through competition modern industrial goods" (Bettleheim, C. 1962). The artisans compelled to go back on agriculture. This resulted sub-division and fragmentation of agricultural holdings.

v) Rural indebtedness :

This is one of the most vital problem of Indian village farmers who borrow money from the village money lenders.The money lenders change exorbitant rates of interest and the amount increased in a compound way that is very difficult for the borrower to repay it in full amount and ultimately the money lenders acquired agricultural land from the borrower and a very small size of holding is left for him (borrower). In this way millions of village farmers fall into this trap and land is acquired by money lenders. Hence the small farmers become landless.

vi) Attachment to Landed Property :

The customary tendency of Indian farmers is that they want to stay near to their landed properties - resulting division of land holding in smaller size. They do not lookout for an alternative employment.

vii) Growth of urbanization :

A faster growth of population, impact of western culture, industrial development, advancement in technological innovations - all these result in sprawling urbanization and which leads to division and fragmentation of land holding in size.

viii) More productive Areas :

The more productive areas attract the people to settle close to the land and people multiplied faster and consequently witnessed sub-division of land holding for a long duration.

Apart from the above stated factors, land tenure systems, distance from urban centres, types of farming enterprises, relief, soil, rainfall and sub-soil water depths etc. influences on the size of land holdings.

1.4 PROBLEMS OF SUB-DIVISION AND FRAGMENTATION OF LAND HOLDINGS

Earlier we have mentioned various causes for the sub-division and fragmentation of agricultural landholdings. Among which the faster growth of population is a crucial factor indiminishing the size of holdings. On account of continuous sub-division of ancestral land holdings; every patch of land becomes so tiny that it is almost impossible to turn over a bullock pair on this land. The tiny land is a hinderance as far as agricultural development is concerned because it is not possible to use modern agricultural mechineries, HYVS, chemical fertilizers, manures etc. There is no way to construct wells, fencing of land, protection of crops from pests and improvement of drainage system. There is a wastage of land in boundaries and fencing (Dutt and Sundharam; 1984). This practice is very common in rural areas and where sometimes quarrels over boundaries of small patches of land lead to litigation.

As the tiny farmers cultivate the land by traditional method, the cost of production becomes very high as compared to large farmers who practised agriculture by modern agricultural tools. The small holder suffers the greatest disadvantage in the cultivation of crops which require marked seasonal labour inputs with lengthy intervening slack periods and which need elaborate and costly processing (Fryer, 1965).

The social and economic implications of sub-division and fragmentation of landholdings is that the marginal and small farmers have continued with their subsistence type of farming. The tiny holdings even do not support farmer's family and the marginal and submarginal farmers either join as a farm labour or migrate to urban areas in search of work. For the Canadian prairies a further decline of farm size is a threaten to rural population for their sustainability and hence rural population are bound to join public transport, hospitals, schools and retail outlets" (Brierley and Todd, 1990). It is proposed that the base of employment of rural population has changed from farm services to manufacturing (Hart, 1991). It is examined that due to change of farm size structure. There is a clash between technological change in agriculture and cultural ideals of western societies in response to equal right to till soil family sized units. A significant proportion of land holdings are in the hands of large landowners and a small proportion to small land owners, this inequality has threatened a collision between small and large Farms," (Gregor; 1982b).

CHAPTER - TWO

2.1 CONCEPT OF PRODUCTIVITY

The pattern of agricultural productivity of any country determines the level of agricultural development, magnitude of standard of living, economic condition or economic stability. It also fulfils the food demand of the people.

There is generally two terms such as fertility and productivity. The traditional nation is that productivity depends on fertility of the soil. But there is distinction between productivity and fertility, Productivity simply indicates the agricultural power of crop production in a particular region and this power would not depend on the nature or the efforts of man, Fertility can be expressed as the ability of soil which supplies all the nutrients for the balanced growth of plants. Therefore, productivity and fertility differs from each other.

Agricultural productivity is very important from economic point of view and which has shaped the agricultural regions or countries in term of economic level. Keeping this view in mind, many geographers, economists have attempted to define agricultural productivity from their respective angles.

Agricultural productivity generally refers to yield per unit area or ratio between the index of total output

and index of total input with reference to farm or crop production. " Productivity expresses the varying relationship between agricultural output and one of the major inputs like land or labour or capital, other complementary factors remaining the same"(Dewett, 1966). It may be borne in mind that productivity is physical rather than a value concept.

"Productivity as defined in economic or in agricultural geography as output per unit of input or per unit area respectively and the improvement in agricultural productivity is generally the result of a more efficient use of the factors of production, viz. environment, arable land, labour, capital and the like,The level of agricultural productivity, as a concept means the degree to which the economic, cultural, technical and organisational variables (the man made frame) are able to exploit the abiotic resources of the area for agricultural production."(Sharma, 1992).

"Productivity is a physical relationship between output and the input which gives rise to that output"(Saxon, 1965).

"Productivity is broadly used to denote the ratio of output to any or all associated inputs, in real term" (Horring, 1964).

"productivity is defined in economics as the output per unit of input....The output of securing an increase in output from the same input or of getting the same output from a smaller input"(Pandit, 1965).

"Agricultural productivity is defined as the value of output of crops per hectare of gross cropped area or output per unit of net sown area (rather than gross cropped area) which takes care of cropping intensity" (Dev, 1991).

Hence, producitivity is not the result of one factor but associated with other factors. It simply means yields per unit of area. With the rapid pace of economic development and appropriate technological advances, agricultural productivity implies the efficient use of environment, labour and capital.

Productivity of agriculture can be analysed from three different angles viz. land productivity, labour productivity and capital productivity.

(i) Land productivity :

This is permanent as well as fixed among three categories. The focus of attention has given on land which supports a large number of population. Land productivity can be expressed in terms of productivity per acre or yield of crops per unit area of land. The improvement of land productivity is done by practising

multiple crops on the same land in a year or it may be done to cultivate high-value crops instead of low value crops.

(ii) Labour productivity :

The main purpose of labour productivity is to achieve the income by the population employed in agriculture. This cannotation is very difficult to define, although it is simply defined as number of hours per worker engaged in agriculture to produce certain crops. But in those area where meno (specialised-Single crop) crop is practised-labour productivity may be defined as the total agricltural output per unit of labour.

The total agricultural output may be expressed in terms of gross farm output or it may be defined as the value added by labour and other inputs, like value of fertilizers, pesticides insecticides, fuel and these are substracted from the value of output as to get the net contribution of agriculture. In developed countries where a comparison is made with reference to income and producitivity between agricultural occupations and other occupations. But in developing countries it is not possible because of abundance of farm labour.

The importance of labour productivity can be seen in two ways;

i) it influence on national prosperity or national income.

ii) it determines the standard of living of the agricultural population.

Therefore, if any country wants to develop its economic prosperity. There is an utmost need (i) to provide technical assistance as well as infrastructural facilities (housing, sanitation, medieal treatment, balanced diet etc) to the labour population, (ii) to transfer the labour popula tion from low productivity region to high productivity regior

The output per man can be achieved in agricultural economy as follows;

i) by giving each farm worker more land and livestock
ii) by making each unit of land and livestock capable of yielding a bigger output.
iii) capital productivity

The determination of this phenomena is very complicated because of the diversity of farms and diversity in the investment of capital which is utilized in agricultural production process. The capital is used for purchasing of land, for improvement of land, land reclamation, drainage, irrigational purposes, for purchasing livestock, feeds, seeds, fertilizers, agricultural implements and machinery crop protection chemical etc.(Shafi, 1983).

1.2 MEASUREMENT OF AGRICULTURAL PRODUCTIVITY

The measurement of agricultural productivity is a very complicated phenomenon because it varies from region to region, country to country with time and space. There is no generalised method through which one can easily measure the agricultural productivity. Many scholars introduced different techniques or methods to compute agricultural productivity. Some of the important approaches are given below in brief.

1. Thompson (1926) who measured the relative productivity of British and Danish farming with the help of gross output of crops and livestock by taking following variables :

   i) the yield per acre of crops
   ii) the livestock per 100 acres
   iii) the gross output per 100 acres
   iv) the proportion of arable land
   v) the number of persons employed
   vi) the cost of production expressed in terms of wages and labour cost, rent or interest.
   vii) Prices relative profitability and general economic conditions.

2. Ganguli (1938) computed agricultural productivity by following way :

i) He took a unit of area under area crop 'A' of a certain region. This area is the proportion of the total cropped area.

ii) He determined Index number of yield by dividing the yield per hectare for the whole region.

iii) He multiplied the proportion of the area under 'A' and the index number of yield.

3. Kendall (1939) put forward a system of four coefficients,

i) Productivity coefficient

ii) Ranking coefficient

iii) Money value coefficient

iv) Starch equivalent or energy coefficient

The productivity coefficient and the ranking coefficient help to calculate yield per acre, not production. He calculated the crop producitivity with the help of index number method in which yield of different crops can be expressed either in terms of money value as expressed in price' or interms of energy'as expressed in starch equivalent'

The disadvantage of money value index is that the price data of certain crops are not available and the price of crops fluctuate from season to season. Another major difficulty is that there is no uniform price of certain crops throughout a region or a country. Local variation of price of crops depend on the nearness to market or relative

nutritive character of the crops. He measured agricultural productivity by this technique as follows. The crop production of each unit area is valued by multiplying the volume of production of particular crop by its price. Then adding the value of total selected crops and after that total value is divided by total area in the unit area under total selected crops. The result gives a money value per unit area of selected crops.

In regards to energy coefficient or starch equivalent Kendall suggested that energy coefficient edoes not depend on nutritional factor but depends on starch equivalent and it is decided, (i) in terms of gross or net digestible energy (ii) in terms of by product energy such as wheat or barley straws or the green stalks of maize, Jawar and bajra, (iii) It is taken into consideration that certain crops first fed by livestock and then wheat, milk is consumed by human beings.

Kendall preferred the production of energy in terms of gross energy.The reason of rejection of net energy is that it is capable of doing work and building of body only.

The money value coefficient does not hold the value of by-product whereas the energy coefficient helps to estimate the production by weight of by-product to the main product of wheat, barley, oats, bajra, beans, peas etc.

The above mentioned techniques for computing agricultural productivity need a higher mathematics as well as there is a practical problem in money value coefficient and energy coefficient or starch equivalent. Then Kendall looked for another method viz. ranking coefficient method for measuring agricultural productivity. This method assists to explain the way by arranging the same range of crops in descending order. Then agricultural productivity can be easily assessed.

4. Hirsch (1943) introduced 'crop yield index' to estimate agricultural productivity. It is computed from the averag yield of different crops of one farm or locality relative to the average yield of same crops of other farm or locality.

5. Zobel (1950) laid emphasis to measure labour productivity According to him production of labour is the ratio of tota output to the total man-hours consumed in the production of that output (total) resulting output per man-hour. This has been expressed by following equation;

$$\pi = f\ (P.L.)$$

where,

π = productivity of labour

P = Production

L = Labour utilized

6. Stamp (1952) applied Kendall's ranking coefficient technique on an international level in order to determine agricultural efficiency of major crops of a number of countries of the world.

7. Huntington and Valkenburg (1952) considered land productivity on the basis of acre-yields of eight crops, raised very widely in Europe. They selected average yield per acre of each for Europe as a whole and assumed an index of 100 for it. Then they calculated the specific yield index of each county.

8. Stamp (1958) introduced another method to calculate agricultural productivity. For this purpose he converted total agricultural production into calories. The calorie intake is a measure of the general health of a person because it determines the amount of heat and energy is needed by human body. The British Medical Association suggested that 2,100 calories energy is required for a woman in sedentary occupation perday while 4,250 calories for a man who is engaged in active manual work per day and 3,400 calories for teenage boys. The children upto 14 years needed 800 calories energy per day. Stamp estimated the average desirable intake which is 2,460 calories per day or about 900,000 calories per year in Europe. This calorie intake is called 'Standard Nutrition unit.'

9. Shafi (1960) calculated agricultural efficiency of Uttar Pradesh with the help of Kendall's 'ranking coefficient method. He took eight food crops grown in each of the forty-eight districts of the state. Then he applied ranking coefficient method to acre yield figures for the two quinquennial years ending 1952 and 1957.

10. Loomis and Barton (1961) have computed agricultural productivity of U.S.A. by measuring agricultural input and output. The input includes all production factors depending upon farmer's decision.

11. Meiburg and Brandt (1962) have surveyed eight indices of agricultural production between 1866 and 1960. These indices are related to the united states agricultural output and which estimate total productivity.

12. Mackenzie(1962) measured the efficiency of production in Canadian agriculture by applying the coefficient of output relative to input. He proposed that the concept of productivity measurement is difficult to define and even more difficult to quantify.

13. Commen (1962) computed the agricultural productivity of Kerala on the basis of yield per acre.

14. Enyedi (1964) after working in Hungurian agriculture has given a formula for assessing agricultural productivity. The formula is given below :

$$\frac{Y}{Yn} : \frac{T}{Tn}$$

where,

Y = total yield of the respective crop in the unit area

Yn = total yield of the crop at the national level

T = total cropped area of the unit

Tn = total cropped area at the national level

15. Horring (1964) proposed that the productivity is not only based on the relationship between output and input but based on the difference between two or more relationship, such as differences in the same agricultural region or sub-region between successive period (in time), differences between similar agricultural region in different countries during the same period (in space).

16. Chatterji and Maitreya (1964) have measured the level of agricultural development and producutivity during 1950-51 to 1957-58 in West Bengal by selecting only two crops viz. rice and jute. They applied acre yield figures for this purpose.

17. Dhondyal (1964) has determined variations in agricultural development and productivity by considering three representative districts of Uttar Pradesh in regards to the role of credit, intensive crop enterprises and in influence of irrigation water during 1962-63.

18. Garg (1964) has determined the trend of agricultural development in terms of total cropped area, gross irrigated area and food grain production particularly of Gorakhpur district of Eastern Uttar Pradesh and of Meerut district of Western Uttar Pradesh. The agricultural productivity has been measured by assessing acreage production and average yield per acre of three crops viz. rice, wheat and sugarcane during 1951-52 to 1960-61.

19. Gopal Krishnan and Ramakrishna (1964) have determined the degree of variations with respect to

i) agricultural output per acre (Rs.)

ii) output per head of agricultural population(Rs.)

They also accounted the reasons of variations in the each of twenty districts of Andhra Pradesh during 1959-60. The ingredients associated with output per acre are :

i) normal level of rainfall

ii) percentage of current and old fallows

iii) percentage of area under irrigation

iv) percentage of literacy

v) percentage of population engaged in Agriculture

vi) Intensity of cropping pattern

vii) Percentage of gross value other than foodgrains and fodder.

viii) The percentage of area under all crops excluding fodder

ix) density of agricultural population per acre

x) Percentage of total area under commercial crops including rice.

20. Sanchety (1964) has measured agricultural productivity by selecting principal cereals in the dry areas of Rajasthan from 1956-57 to 1958-59 and 1959-60 to 1960-61, and also recorded the changes between these periods. He assessed productivity on the basis of average yield per acre.

21. Sapre and Desh Pande (1964) have tried to refine Kendall's ranking coefficient method and they applied weighted average of rank' instead of Kendall's method. They took a proportion of crop area to the total crop area of the district. In this method 'Weighted rank' is determined by the ranking position of a crop and which is multiplied by the magnitude of area to the total cropped area.

22. Sharma (1965) has suggested different Parameters for the measurement of agricultural productivity and these parameters which are related to productivity are land, labour and capital and overall resources employed in agriculture. He further proposed that the output of foodgrains vegetables, fruits and sugarcane can be converted into calories and non-foodgrains such as cotton and other fibres should be measured in terms of prices of their products, He has evaluated the value of production on the basis of wholesale prices and

also stressed on agricultural workforce for productivity measurement.

23. Khusro (1965) has assessed agricultural productivity by considering output per unit of a single input andoutput per unit of cost of all inputs used in agricultural production.

24. Saran (1965) has applied Cobb-Douglash 'Production Function' approach for the measurement of productivity and which is expressed in terms of input/output, relationship between several inputs and one output in agriculture. The production Function' can be expressed in the following form.

$$Y = A\, x_1^{b}\, x_2^{c}\, x_3^{d}\, x_4^{e} \ldots\ldots x_n^{y}$$

where,

Y = productivity

$X_1, X_2, X_3, X_4 \ldots X_n$ = denote different inputs (Land, labour, capital and other working expenses)

$b, c, d, e \ldots\ldots y$ = indicate elasticities of the respective inputs.

25. Tambad (1965 and 1970) computed agricultural productivity with the help of 'Crop Yield Index'. This method is expressed to the average yield of various crops of a farm relative to the yield of same crops of another farm. This is shown by the following equation;

$$\text{'Crop Yield Index} = \frac{\sum_{i=1}^{n} \frac{Yi}{Yio} Ai}{\sum_{I=1}^{n} Ai}$$

where,

i = 1,2,3,4....n are the number of crops considered in an unit area or year

Yi = yield per acre of crop i, in a farm area or year

Ai = The weightage of crop i denoted by area under the crops in terms of percentage of total cropped area.

Yio = The average yield per acre of crop i, in the group of farms.

26. Shafi (1965) measured the agricultural productivity by selecting labour population engaged in agriculture, He computed agricultural productivity by dividing the total production with the number of man hour or the total workers are divided by per unit of production.

27. Agarwal (1965) has adopted 'Factorial Approach' to measure agricultural efficiency particularly in the Bastar district of Madhya Pradesh. He selected human controlled variables like crop superiority, crop commercialization, crop security land use intensity and power input excluding environmental factors.

28. Buck (1937) applied 'Grain Equivalent' approach for assessing agricultural progress in China. He converted all agricultural product into kilograms in terms of grain equivalent only to select as a unit of measure whatever type of grain is predominant in the region.

29. Clark and Hoswell (1967) modified Buck's approach and expressed the putput in terms of kilograms of 'Wheat Equivalent' per head of population.

30. Bhatia (1967) computed the changes and trend of agricultural efficiency in Uttar Pradesh during 1953-63 by adopting Ganguli's productivity measurement technique which is devised as follows;

i) $$Iya = \frac{yc}{yr} \times 100$$

where,

Iya = the yield index of crop 'a'

yc = average acre yield of crop 'a' in the component unit

yr = average acre yield of crop 'a' in the entire study area.

ii) $$Ei = \frac{Iya \cdot Ca + Iyb. Cb + ...Iyn.Cn}{Ca + Cb + ... \quad Cn}$$

where,

Ei = agricultural efficiency index

Iya, Iyb = indices of various crops

Ca, Cb = Proportion of cropland devoted to different crops.

31 Shafi (1967 and 1969) has assessed the agricultural efficiency in India with the help of Stamp's 'Standard Nutrition Unit' method. He has taken the district as an areal unit and considered all the food crops which are grown in India.

32. Noort (1967) putforth 'net total productivity' which is a technique to measure field productivity and to make comparison, in time or 'in space'. The main purpose of this technique is to examine the changes of labour and capital inputs in agriculture.

33. Sinha (1968) has applied 'Standard Deviation' method for determining agricultural efficiency in India. He considered twenty five major crops and grouped them into cereals, pulses, oilseeds and cash crops. He also took yields per hectare of cereals, pulses, oilseeds. In case of cash crops, he calculated the amount of money per hectare on the basis of wholesale price. The standard score has been calculated as to give them weightage, then he multiplied by these values with acreage figures.

34. Shafi (1972) computed the index of productivity coefficient by modifying Enyedi's productivity index formula. The modified formula would be x read as follows :

$$\left(\frac{yw}{t} + \frac{yr}{t} + \frac{ymi}{t} \ldots n\right) : \left(\frac{Yw}{T} + \frac{Yr}{T} + \frac{Ymi}{T} \ldots n\right)$$

or

$$\frac{\sum^{n} y}{t} : \frac{\sum^{n} Y}{T}$$

where,

yw, yr, ymi = total yield of the respective crop in the district

Yw, Yr, Ymi = total yield of the respective crop at the national level.

t = area planted under the crop in the distri

T = area planted under the crop at the nation level.

35. Hayami and Ruttan (1970) have differentiate the agricultural labour productivity between developed countries and less developed countries for three different periods - 1955 (1952-56 average), 1960 (1957-62 average) and 1965 (1962-66 average) by applying Cobb. Dauglas 'Production Function' technique. They have taken independent variables. Such as land, labour, livestock, fertilizer, machinery, education and technical man power.

36. Singh (1972) put forth a new method for measuring agricultural efficiency. This method is associated with the carrying capacity per unit area with reference to population in accordance to output per unit area.This method is devised as follows;

(i) $Cp = \frac{Co}{Sn}$

where,

Cp = the carrying capacity

Co = the caloric output

Sn = The standard nutrition for ingestion in calories per person per annum.

(ii) $Iac = \frac{Cpc}{Cpr} \times 100$

where,

Iac = the index number of agricultural efficiency

Cpc = the carrying capacity in terms of population, in the component enumeration unit.

Cpr = The carrying capacity in the entire region.

37. Raheja, et al (1977) they have measured the agricultural productivity by considering high yielding varieties of seeds and which have been collected under 'Sample Surveys for Assessment of High Yielding Varieties Programme' during 1973-74. They also computed a regional variation in productivity in terms of yield of crop per hectare in India.

38. Singh et al (1977) pointed out that an increase in yield per hectare during 1950-51, 1960-61, 1970-71 has deeply rooted between the relationship of output of foodgrains and inputs such as fertilizer, proportion of area under multiple crops and sown more than once, gross irrigated area.

39. Nangia et al (1977) calculated agricultural productivity in terms of money value during 1974-75. They also considered other factors like environmental, technological and institutional which together influence on agricultural productivity

40. Bhalla (1978) has suggested that the agricultural productivity can be measured with the help of crop's price and labour productivity.

41. Singh (1979) has introduced a method comprising two-dimensional picture of agricultural productivity, viz. intensity and three variables;

i) yield

ii) grain equivalent

iii) cropping system.

2.3 CAUSES FOR LOW PRODUCTIVITY

One of the most distressing facts about Indian agriculture is the extremely low yield per hectare. If a comparative study is conducted, it seems agricultural productivity in India is very less than in any other advanced country of the world. Productivity of wheat in India is about 79 percent of the productivity in the U.S.A. and about 36 percent of the productivity of France.The productivity of China it also higher than that of India. As far as rice is concerned, productivity in India is less than one-third of the productivity in Japan and about 37 percent of the productivity in China. The productivity of cotton in Indian is less than one-fifth of the productivity in U.S.A. and China, The productivity of cotton is also less than by one-third to that of Pakistan.The productivity of groundnut in India is 27 percent of the productivity in U.S.A. 31 percent of the productivity in Argentina, and 35.7 percent of the productivity in China.Similar conditions also prevail in other crops.

There are various factors responsible for the causes of low productivity of Indian agriculture. Some of them are given below :

i) Small size of farm :

The average size of a farm in India is very small it about 1.70 hectares which is too small for agricultura

operations. This land holding is getting smaller with the passing of generations. This is largely due to the backward, nature of agriculture and faster growth of population which is leading to subdivision and fragmentation of holdings. This brings a decline of average productivity.

ii) Lack of Moisture :

Agricultural productivity is a function of both the cropping pattern and the yield levels of individual crop. The high yielding varieties of individual crops in an operational fields are directly dependent upon adequate and timely supply of moisture. But the supply of inadequat moisture has a negative impact on overall productivity and cropping pattern. Only some coarse cereals such a bajra, jowar and hardy varieties of pulses are grown successively in this condition.

iii) Quality of soil :

The inherent quality of soil or type of soil also influences on the cropping pattern and yields of individual crop. The rich alluvial soil is found only in the southern India, along the Mahanadi, Godavari, Krishna and Kaveri rivers belts,upper, middle and lower Gangetic plain where different types of crops are grown successfully. The remaining large part of India where cultivatio have gone out because of growing sandy, silty, salinity,

aridity, alkalinity and semi-desert conditions and also mountains soils have negative impact on average productivity.

iv) Rapid growth of population :

A large number of population, about 70 percent depend constantly on agriculture. The agricultural population in 1901 was 163 million whereas in 1991. The agricultural population was 591 million. The excessive increase of population could be absorbed by agricultural sector, not by industries or handicraft.Because of this, our land resources have been taken extensively thereby creating a loss of fertility of the soil. The increasing population pressure also lead to a sub-division and fragmentation of land holdings which resulted in declining of area of farm size per capita and which ultimately caused low productivity.

v) Concentration of Tribal Population :

A large concentration of tribal population are mainly found in 12 states in India where there is technological and capital gap prevailing among them. This gap is due to inadequate information or poorer resources base in the areas of tribal population. Hence, shifting or Jhum cultivation is practised

by tribal population and to some extent settled cultivation is done. This is also a crucial factor for low-productivity.

vi) Lack of education :

It is seen that many of the Indian farmers are illiterate, ignorant, superstitious, conservative. They are bounded by outmoded customs and institutions such as caste system, joint family system etc. The farmers are fully satisfied with the primitive system of cultivation which resulted low productivity. The backwardness and stagnation is changing with economic progress.

vii) Lack finances :

Due to inadequate provision of finance and marketing facilities, most of the cultivators are heavily indebted to the village money lander; they have to pay high rates of interest. As a result, the cultivators are often bound to sell their produce to the moneylander at low prices; or they are compelled to sell in the market immediately after the harvest when the prices of the crops are usually the lowest, in order to meet the demand of the money lander for repayment. Besides, there is a long chain of middlemen who take away a considerable percentage of the profits. At one time farmers are bound to lose their lands and become a landless labourer. At present moment, co-operative as well as Government

finances exist but almost insignificant. All these factors are responsible for low productivity in India.

viii) Primitive methods of cultivation :

Technologically Indian farmers are backward, using the ancient plough for agricultural production whereas the farmers of western countries, China and Japan adopted modern technique widely. With the introduction of technological development in India.The use of the improved agricultural implements and farm machinery, which has led to a vast increase in productivity elsewhere, is very limited in use. An improved agricultural implements are steal ploughs, sugarcane crushers, pumping sets, water lifts, hoes, seed drills, fodder cutter etc. The cultivators are mostly illeterate and poor, they cannot afford to buy the modern farm inputs which directly affect the productivity in agriculture. Apart from these, an inadequate uses of manure and chemical fertilizers, and used of traditional bound seeds without disease resistant have a negative impact on productivity.

ix) Lack of Water :

A large tract of soil in India is dry and capable to produce good crops unless water is supplied in sufficient quantities. But the supply of water is inadequate, as only 30 percent of the total sown area

is irrigated, while the remaining portion of land has to depend upon the monsoon for supply of water. But the monsoon is uncertain and irregular. Besides all parts of the country do not always get proper rainfall, Hence lack of water affect the total production of crops adversely.

x) Lack of Incentive price :

Due to the absence of proper incentive price, the farmers have to pay high rents to cultivate the land, and there is no security of tenancy. The farmers may by turned out by landlord at anytime, under these conditions, Thus, it is not possible to except higher productivity from the farmer.

Apart from above causes, rackless deforestation, construction of canals and railways, soil erosion, lacks in organisation and leadership, restricted storage facilities, poverty of the peasant, quarrels among farmers are responsible for low-productivity in India.

2.5 RELATIONSHIP BETWEEN LANDHOLDINGS AND AGRICULTURAL PRODUCTIVITY :

A number of agricultural economists and geographers have drawn attention to establish a relationship between land holdings and agricultural productivity. Many studies revealed inverse relationship between farmsize and productivity while other studies argued that agricultural productivity will be reduced if the size of operating unit is reduced through redistribution of land. Therefore, this assumption is of highly positive between the operating farmsize and agricultural productivity. Again some argued that as the farmsize increases, productivity also increases while other economists hold a view that productivity is neutral as between different farmsizes. Another group of economists think that inverse relationship between land holdings and productivity holds over certain ranges of size and not over all ranges of size.

A number of studies have been conducted over the relationship between landholdings and productivity. The farm management studies revealed one of the most important conclusion that "The output per acre declines as the size of farm increases" (Khusro, 1964). "By and large productivity per acre decreases with the size of holding" (Sen; 1962). The explanation is, as the small farmers employed low cost

family labours while large farmers employed highly paid hired labours in a larger proporties but there is some doubts about the validity of the above phenomenon (Sen, 1964). On the basis of farm Management data it is proposed," By and large, inverse relationship between farmsize and productivity is a confirmed phenomenon in Indian agriculture and its statistical validity is adequately established by an analysis of the disaggregated data"(Saini, 1979). It has been observed from Farm Management Research Centre, from selected areas of West Bengal, Uttar Pradesh, Punjab, Orissa, Andhra Pradesh, Bihar and Madras and computed the size of farm, the productivity per acre has been measured in terms of value of output. Then a relationship has been established as "The farmsize increases, The productivity per acre in terms of rupees decrease" (Long, 1969). It is necessary to argue"...That the countries with the highest intensity of land utilization i.e. the highest yields per acre are not characterised by prevailing large scale farms but are countries where small and middle-sized farms prevail, one of the countries with the high yields per acre and a small percentage of large scale farms is the Federal Republic of Germany" (Schiller, 1959).In Japan and Taiwan the relationship between farmsize and productivity is that owner-cultivated small-sized farms are capable of sustaining rapid increases in the agricultural productivity. It has been proposed that "The totality of empirical research

on the relationship between farmsize and productivity has yielded a far from uniform picture. Even these who have emphasized confirmation of the inverse relationship on the basis of individual household data, have noted failure to see such a pattern in several regions. The general conclusion which emerges is that the diversity of Indian Agriculture, regarding the existence of the negative relation between size and productivity, the negative relation may held in certain parts of the country at certain times but not everywhere and not at all times'. It also appears that even which the inverse relation is more frequently confirmed then rejected, it would be a mistake to take it to be an empirical generalisation for Indian agriculture as a whole" (Rudra and Sen; 1980).

The study revealed that, "an inverse relation between farmsize and output per acre does exist in many, but not all parts of the country; 'No inverse relation exists between farmsize and yield per acre'; 'Intensity of cropping is negatively related to farmsize; and the percentage of farms under irrigation is negatively related to farmsize" (Roy, 1980).

In many parts of the country, small farmers have found to irrigate a larger proportion of their cultivated area than the large farmers (Hanumantha Rao, 1965). Besides, the intensity of land use can be expected to be lower among

large farms owing to the problems of supervision and management under labour intensive techniques (Hanumantha Rao, 1966). So far as improved seeds and fertilizers are concerned small farmers do have an advantage in the sense that owing to greater availability of labour and irrigation. They can use more fertilizer per acre than the large farmers. But this prospect need not materialise because large farmers, owing to their better access to x credit and modern inputs, may in fact use more of these inputs per acre (Srinivasan, 1972). According to the All India Rural Debt and Investment Survey (1961-62). The distribution of credit from the cooperatives was inequitous as among different asset groups. Althoug productive assets (irrigation, cattle) per acre decline with increase in size of holding. Owing to irrigation, small farms get greater facilities than large farms and hence small farmers have a tendency to produce more than large farmers (Bharadwaj, 1974).

Although many studies supported inverse relationship between landholdings and productivity but it can not be granted. A number of studies carriedout in the context of recent technological developments in agricultural sector and the results show a contrary to inverse relationship. A study has been conducted in Meerut district in Uttar Pradesh. The result is that "in the context of new technology there is no indication of decrease in output per hectare with an

increase in farmsize, and therefore, the hypothesis of inverse relationship is rejected in the area under study" (Singh and Patel, 1973). Owing to modern agricultural innovations, it is proposed that farm technology undergone change and large farmers take greater interest to put more inputs at proper time and which yield maximum profit.

By taking data from different sources, it has been observed as "despite better access to resources, output per acre among large farms under the traditional labour intensive technology was lower than among small farms, as the cost of labour (hired) was higher for them than for small family farms. Also managerial and supervisory diseconomies of large size under labour intensive methods accounted for lower labour input per acre among large farms. Technological changes created new production. Possibilities for large farms who could now increasingly substitute capital for labour by adopting biological as well as mechanical techniques and produce output at a faster rate than small farms. The latest evidence shows that the inverse relationship between farm-size and output per acre found under traditional technology no longer holds with the adoptation of new technology" (Hanumantha Rao, 1975). As the farmsize increases, the agricultural productivity also increase if we used capital and labour in agriculture (Bowler, 1983). An increase of farmsize and productivity is due to more accumulation and

concentration of wealth and labour (Lund and Hill, 1979). Theoritically, optimum size of farm varies by farm type (Found, 1971). It is seen in Canada, why large farms are being used for cattle rearing, medium-sized farms for grain and mixed farming, and small farms supply essential commodities to nearby urban markets (Todd, 1979). Moreover, the relationship between farmsize and productivity can be established by selecting appropriate type of farming, small farms achieve a high financial profit, devoting either to intensive livestock farming based on poultry, dairy or cows, or to intensive horticulture and fruit production. By contrast, large farms can be economically viable by more extensive farming enterprises, including cereals, field vegetables, beef cattle and sheep. Again farms have to specialize just one or more than one crops whereas large farms operate more diversified crops.

The use of modern farm machinery requires a minimum land area and high costs.The small farmers cannot afford to buy and operate modern machinery because of high costs. But large farmers can adopt new technologies and practices which bring in the adoptation of new crops and livestock, farm plant and farming is done by irrigation and use of agrichemicals (Clark, 1986).

The weakening or disappearance of the inverse relationship between farmsize and output per acre implies

a higher rate of growth of output among large farms when compared to small farms. This has been achieved by large farms not through greater application of labour inputs per acre but through the greater use of capital inputs or the increasing substitution of capital for labour (Hanumantha Rao, 1973).

Therefore, farmsize and productivity varies with the impact of agricultural innovations and farming types.

CHAPTER - THREE

It is essential to review the works of these who have thrown light on relationship between landholdings and agricultural productivity in many parts of India and abroad. Some of them examined an inverse relationship between landholdings and productivity, while others pointed out that there is a disappearance or weakening of inverse relationship between landholdings and agricultural productivity with the adoption of new technology. Different approaches by different investigators have been traced in the above context.

A.K. Sen (1962, 1964, 1975) examined three results and found it to be broadly valid in Indian agriculture. One result (1962) stated that by and large, productivity per acre decreased with the size of holding. He again (1964) wrote that the statistical basis of the observations around which all controversy is centred, is not really something that has been proved beyond the legitimate doubts of exacting statisticians. He concluded (1975) that perhaps the only clear finding is that the size and productivity inverse relationship is based on size class. Average data is vindicated also by disaggregated interfarm data from different villages in the same region considered together. But the picture is less clear for data within a village. But this makes a problem of the validity of the pooling procedures. Regarding this observation he pointed out that the fertility explanation

of productivity differences can be established from the data which can be collected from villages and there are also some differences in rainfall, irrigation, soil moisture and these differences may be eliminated from village data. He also laid emphasis on labour cost i.e. the small cultivators want to work in the village. Therefore, "clearer inverse relationship between size and productivity would be expected in farm data from different villages than from the same villages".

Deepak Mazumdar (1965) concluded on the basis of Farm Management Survey in India that as the size of farm decreases the output per acre increases.

C.H. Hanumantha Rao (1966) made generalization as "in all the districts, the percentage of cultivated to uncultivated area as well as the percentage of cultivated area cropped more than once decreased sharply with increase in the holding size. This is because, among the factors, the percentage of holding irrigated invariably declines with increase in the size of holding". According to the report of farm.

Management Survey in India (1966)" in some of the regions like Punjab, Uttar Pradesh, Maharastra, Madras, Andhrapradesh and Orissa, output per hectare decreases with increase in farmsize" and.... yields per hectare and, therefore, gross income per hectare of paddy generally

decrease as farmsize increased in all the regions except in West Bengal and Andhra Pradesh where no definite trend is discerible".

A.P. Rao (1967) applied Logarithmic linear function to farm level data of the same village and concluded that productivity remained constant over all holding sizes in all the villages, which indicates that holding size has no effect on productivity. But he calculated yield per acre without using gross cropped area.

A.M. Khusro (1968) gave some generalizations about the relations between farmsize and farm efficiency which are based upon a remarkable repetitiveness of some phenomena almost everywhere among the areas studied. Later be made some generalizations that as farmsize expands, gross output per acre declines.

Ashok Rudra (1968a) used regression method and suggested that "the inverse relationship between holding size and productivity observed in Indian agriculture could be a spurious statistical relationship arising due to the process of aggregation over villages involved in presenting Farm Management data". He (1968b) applied rank correlation technique to the averages of productivity given in the Farm Management studies separately for farms in different size classes. He proved that inverse relationship between

holding and productivity did not exist in many cases (many of his rank correlation coefficients were negative). After using linear regression methods and rank correlation technique he opined that the inverse relationship between size and productivity did not exist within any particular village but arose when the data for different villages were aggregated in the Farm Management studies. This called for rigorous examination of disaggregated data.

Usha Rani (1971) analysed farm level observation of several villages and made conclusions;

i) Yield per acre remains constant over different size groups of farms.

ii) no firm generalization can be made about the variations of intensity of cropping over different size groups.

iii) There are no significant variations in the inputs per acre over different size groups of farms.

G.R. Saini (1971) "analysed disaggregated data for many regions and years; fitted regressions in the form of

$$\text{Log}y = \alpha + \beta \log x$$

where,

x = farmsize

y = value of output

This equation showed that the estimates of β were significantly less than unity". Saini used the observations from all the villages for fitting the regression.

The most detailed study was carried by N. Bhattacharya and G.R.Saini (1972) in Muzzaffar nagar (U.P.) and Ferozepur (Punjab) districts with the help of linear regression method. They established an inverse relationship between farmsize and productivity. In this regard they have prpposed that the negative correlation between farmsize and productivity is therefore, clear for this region (Muzzaffar nagar) in the sense that such correlation is observed within most of the villages and could not have arisen due to the aggregation (i.e. pooling) over villages.....But, on the whole, the size productivity is not at all clear for this region (Ferozepur).

Rajvir Singh and R.K. Patel (1973) attempted to examine the validity of the hypothesis of inverse relationship between farmsize and productivity; and also returns to scale in the context of technological development that has been taken place in the countryside. After an intensive study in Meerut district of Uttar Pradesh and by applying Cobb-Dauglas 'Production Function' equation they suggested that there is no indication of decreasing of output per hectare with an increase in holding size under new

technology and hence, the hypothesis of inverse relationship is rejected in the study period of Meerut district.

Krishna Bharadwaj (1974) used the data of Farm Management studies of individual crops, by applying regression method; concluded. 'In the majority of the cases there was no significant or systematic relation between farmsize and productivity while some cases a significant positive relation between yield per acre and the size of holding. Hence, the inverse relation while not supported invariably, is not rejected either.

A.P. Rao, Saini, Usha Rani, Hanumantha Rao and Bhattacharya applied simple linear regression equation, which is given below;

$$\text{Log } Y = \text{Log } A + B \log x$$

Where,

Y = Value of output

x = Farm size

But Krishna Bharadwaj and Khusro used the following equation;

$$\frac{Y}{X} = A + BX$$

where,

Y = value of output

X = Farm size

Some scholars adopted rank correlation test to findout a relationship between Y and X.

Scholars who supported inverse relationship between farmsize and productivity, explained it by "intensity based" and "quality based".The "intensity based" explanations try to findout those factors which may not affect in large farm but affects small farm in such a way that higher quantity of inputs applied. The "quality based" explanations argue why yields are higher in small farm than large farm.

The Focus of attention was given by different researchers on 'quality based' explanations in the following way;

i) Higher fertility in smaller farms (Khusro, Sen. Hanumantha Rao. Bhagawati and Chakravarty).

ii) Superior technique in smaller farms (Sen, Hanumantha Rao).

iii) Higher managerial efficiency in smaller farms (Hanumantha Rao).

iv) Higher impact of indivisible factors on smaller farms (Khusro, Hanumantha Rao).

v) Effects of fragmentations in smaller farms (Bhagwati and Chakravarty).

vi) Disincentives of tenancy, absentee landlordship etc. (Khusro, Hanumantha Rao, Bhagawati, and Chakravarty).

The "intensity-based" explanations examined the following factors;

i) Family labour being cheaper than hired labour and predominance of family labour on small farms (Sen.)

ii) More intense application per acre of labour as well as other capital and current inputs, irrespective of any price advantage enjoyed by small farmers in respective of these inputs (Mazumdar. Khusro, Bhardawaj, Usha Rani etc.).

iii) Higher intensity of irrigation in smaller farms (Bharadwaj, Hanumantha Rao).

iv) Cropping pattern (Bhardwaj).

v) Higher preference for leisure by big farmers (Hanumantha Rao).

vi) Feedback effect of higher earnings on the productivity of labour (Mazumdar).

Thus, it is observed that 'quality-based' and 'intensity-based' explanations operated together in many places. There is no evidence of favouring 'quality based' explanations singly regarding inverse relationship between farm size and productivity. But one or more factors of "intensity-based" explanations may be expected to be operative to establish inverse relationship between farmsize and productivity.

By adopting standard deviation method G.K.Helleiner (1975) noticed that "existing theory and analysis in Africa,

as elsewhere focuses explicitly or implicitly upon the representative small holder, and plays down to variations in small holder behaviour. Yet not only can this variation be great but it is even possible for the vast majority (or even all) of the farmers in a sample to behave in a way totally different from that which is measured as average behaviour." Here ephasis has given on the farmers behaviour.

The only study of Chattopadhya and Rudra (1976) is truly based on disaggregated data and which does not lead to any clear cut conclusion as to the existence of a so called inverse relationship between farmsize and land productivity. Owning to farm data from same village and different villages they suggested that "if within a single village, productivity of land is invariable with respect to farmsize but if the productivity of land is different in different villages and if the villages with higher productivity of land have small average farm-sizes, then putting together data from different villages would reveal a spurious inverse relationship" and on the other hand, average productivity of land is the same in every village and if within each village the inverse relationship holds, then if the different villages have got different average ranges of farmsizes, the intravillage inverse relationship would get obliterated in the process of pooling of inter village data". Thus, pooled data would give a misguiding results.

The study carried out by Vidya Sagar (1977) in Rajasthan in terms of changes in the gross cropped area, cropping pattern and price structure revealed that more profits in a crop are likely to induce more area under it if there are no technical constraints. The crops shows an increase in the yield rate as well as area.

According to Farm Management Studies (1977) the class-wise values of the multiple cropping index (MCI) is negatively correlated with farm size.This relationship have been carriedout by linear regression method.

$$y = a + bx$$

where,

y = farm size

x = productivity of land or MCI, labour use per hectare etc.

But inverse relationship does not clearly hold as between farm size and yield or labour use per hectare.

On the basis of linear regressions technique A.K. Ghose (1978) has found that when all farms are considered together (Pooled, date), an inverse relation between farm size and output per acre is found. Moreover, the labour input per acre also decreases when farm size goes up. Those relationships are significant at a level of 2.5 percent.

Berry and Cline(1970) gave much emphasis on land reform programmes and they have noted if land reform programmes standout, "thet the small farm sector makes better use of its available land than does the large farm sector...(then) the central policy implication of the analysis is that land redistribution into family farms (assumed to be small) is an attractive policy instrument for raising production and for improving rural employment and equality of income distribution. Again they have considered the relative productivity of small and large farms from both theoretical and empirical stand points and reached the general conclusion that an inverse relationship exists between land holdings and productivity in the main countries of Asia, Africa and Latin America.They also asserted that small farm generates higher land productivity. This statements reveal that such systematic phenomenon exists throughout the non-developed world.

Saini (1979) asserts on the basis of his own empirical investigations into the Indian rural scene that Berry's cline's analysis "has established the general statistical validity of the inverse relationship between farmsize and productivity per acre".

Bhalla (1979) started his analysis on the relationship between land holdings and productivity with the help of the following equations :

$$y = a + b \log x$$

where,

y = output values per acre

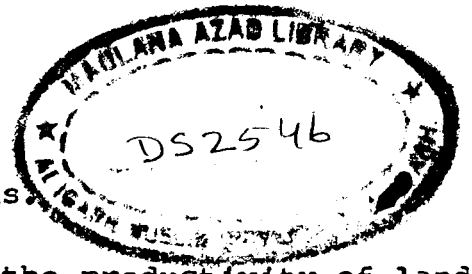
x = farmsize

After computing productivity with the help of this equation by taking different variables; Bhalla has reached the following conclusions," the inverse relationship between farm size and productivity is confirmed and indeed, appears to be quite pronounced, as shown by the high degree of statistical significance of the relationship (high t-statistic)". By taking land quality (soil quality measured by the price of the land) and percentage of irrigated area-fitted with his basic equation, he observed that 'inverse relationship between land productivity and farm size always significantly holds'. Therefore, land quality and irrigation are more relevant factors for explaining land productivity differentials than the farm size, In the context of land reform policy Bhalla concluded "the desirability of land reform' because' a policy like land reform would not only lead to greater equity but also, in all likelihood, to greater output.... and higher efficiency..." From this statement of 'greater output' and higher efficiency it seems to exist a positive relationship between land productivity and the extent of irrigation instead of a negative relationship between land productivity and farm size.

Sharma and Coutinho (1980) have analysed the trends of area, productivity and production particularly of sugarcane in Karnataka. They applied spearman's rank correlation method and which provided a clue of positive relation between production and area as well as productivity. They suggested that area under sugarcane in Karnataka is increasing due to high productivity levels.

Qureshi and Parimala (1981) have laid emphasis on water use to increase agricultural productivity in Tamilnadu. They collected data of twenty four crops and calculated the productivity and then crop production was converted interms of money. By adopting multiple regression analysis method, they observed that majority of the districts have improved agricultural productivity and a few did not show improvement because of environmental constraints. The overall development of technology, seeds, fertilizers and irrigation have facilitated the increase of agricultural productivity.

Singh and Pandey (1981) made an intensive study in Haryana state in response to crop productivity and fertilizer use efficiency. Their studies revealed that the variation of crop yields were generally highest on the small farms and lowest on the medium farms. This may be due to low resource base on the small farms.The medium sized farms appear to be better managed than the small and large farms during the unfavourable weather year and hence the magnitude of crop



loss is small on medium sized farms.

Many studies revealed that the productivity of land is decreasing with the increase of farm size. In this connection Todaro (1981) on the basis of "recent evidence from a wide range of Third World countries....clearly demonstrates that small farms are more efficient.....producers of most agricultural commodities".

Mansoor and Pant (1984) have conducted a study to assess the impact of new technology on agricultural sector in Chamoli district of U.P. on the basis of student t' test' and correlation analysis. They have suggested that there is an inverse relationship between land holdings and agricultural productivity during 1970-71 and 1980-81 period. They have stressed emphasis on improved technology and irrigation in order to increase food crops production.

Mishra (1982) while calculating the agricultural productivity in Eastern Uttar Pradesh pointed out that more than half of the total districts of Eastern Uttar Pradesh have shown a high positive relationship between productivity and land holdings.

Barbier (1984) "first considered the whole set of the sampled farms in the Hooghly district (W.B.), it is shown that there exists no inverse relationship. The"very small & farmers" having the low level of output, labour use and soil

exploitation. Secondly the small farms' got the highest average level of yield' and labour use per hectare and of cropping intensity. The medium and large farms have somewhat higher values of output." From this observation he concluded that "there is no inverse relationship in the district of Hooghly between farm size on one hand and the productivity of land. The labour use or the cropping intensity on the other hand. Apparently, the associations between those variables are of a discrete kind and resembles a church'sroof observed side ways, with its spire, its nave and a long chancel."

Sanyal (1984) tried to findout an inverse relationship between holding size and productivity with respect to unemployment rate and other variables. He took six variables such as,

X_1 = holding size
X_2 = landless households
X_3 = Number of small operators,
X_4 = farm workers
X_5 = Household neither having cattle nor buffalos,
X_6 = Agricultural Productivity.

With the help of regression analysis, it was clearly seen that 38 percent of the total variation in unemployment rate was explained by this set of variables. The inverse relationship between holding size and productivity is also observed with respect to landless household and small operators of holding

size. The important result is that larger holding would reduce unemployment rate.The marginal land holders have higher unemployment rates than "those not possessing anyland."

Sharma and Jain (1985) have examined the role of socio-economic condition and agricultural inputs that increase yield of crops in Madhya Pradesh.Least square method has been adopted to findoutt the growth of output of crops. Their study shown that there is a regional disparity in the growth of output of crops because of the changes of area and yield rates and population pressure is also high especially in cropped area. They write, "very few districts with high productivity and high growth have been recorded because of intensiv use of yield raising technology, irrigation, HYVS and fertilizer while predominantly, marginal and small farms are not able to acquire these inputs to put on their own land. Thus, low productivity and its imperceptible rate of growth in these areas should be perceived in their total perspective".

Singh (1986-87) carriedoutt a study in Aligarh district of Uttar Pradesh and applied regression analysis method. She pointed out that the maximum profit goes to medium farms followed by semi-medium and large farms. In this regard she concluded that "technological changes are contributing to wiping out the inverse relationship between farm size and output per heetare found under the traditional labour intensive

technology which are favourable to small farmers".

Pokhriyal and Bist (1987) studied the Himalayan region and come to conclusion that the law of inheritance is responsible for sub-division and fragmentation process. Consequently the size of land holding is reducing. The marginal and small holdings lie at a greater distance and are being unirrigated As a result cultivation is becoming more and more uneconomical. Thus, irrigational facility is needed to increase the productivity of the food crops.

Srinivasa, Banakar, Basavaraj and Hugar (1988) all scholars paid attention to analyse the contribution of various factors to the productivity difference between small and large farms with the help of (i) neutral technological differences, (ii) non-technological differences and (iii) inputs use differences. The difference of productivity can be estimated by using loglinean production functions method separately for small and large farms.

Chattopadhya (1989) examined a relationship between landholding and farm profit with the help of.

i) productivity of labour and wage rate
ii) The intensity of labour cost to cultivation
iii) The composition of cost of cultivation in terms of labour cost and material cost.
iv) The productivity of land and the cost of cultivation.
v) The intensity of profit according to the size of holding.

In conclusion it is proposed that maximum benefit goes to medium farm followed by semi-medium and large farm.

Borthakur and Changmai (1990) examined an intra-regional analysis of low productivity area of Assam. They applied crop-yield index method to compute agricultural productivity.After an intensive study, they opined that agricultural production and productivity primarily depends on physical, socio-economical and tech-organisational factors.

Thakur, Moorti and Sharma (1990), have carriedout a study on tribal farms of Himachal Pradesh and this study indicates that the proportional relationship between land holdings and productivity would exist by increasing the use of human labour.

CHAPTER - FOUR

4.1 PHYSICAL ENVIRONMENT

Aligarh is one of the important districts of Uttar Pradesh. It is located in the Western part of the state, at a distance of about 126 kms from Delhi. It lies in the central part of Ganga-Yamuna Doab. The district comprises the northern most part of Agra division. It is bounded by the Bulandshahr district in the north; Mathura district in the South and South-West and Etah district in the east and south-east. The extreme north-eastern boundary, formed by the river Ganga, separates the Badaun district from Aligarh whereas the extreme north-western boundary, formed by the river Yamuna, separates Aligarh from Gurgaon district of Haryana state (Fig. 4.1.1).

The district of Aligarh spreads from $27^{o}29'$ to $28^{o}11'$ north latitudes and $77^{o}29'$ to $78^{o}38'$ east longitudes. The greatest width from east to west is about 116 kilometers and the maximum length from north to south is about 72 kms. The district according to 1991 census, has a population of 3,295,982 and spreads over an area of 5,019 square kilometer. The density of population is about 657 persons per square kilometer. About 70 percent of the total population is engaged in agricultural activity and about 75 percent of the total population lives in rural areas. The rural population population is 2,483,579 while the urban population is 812,403

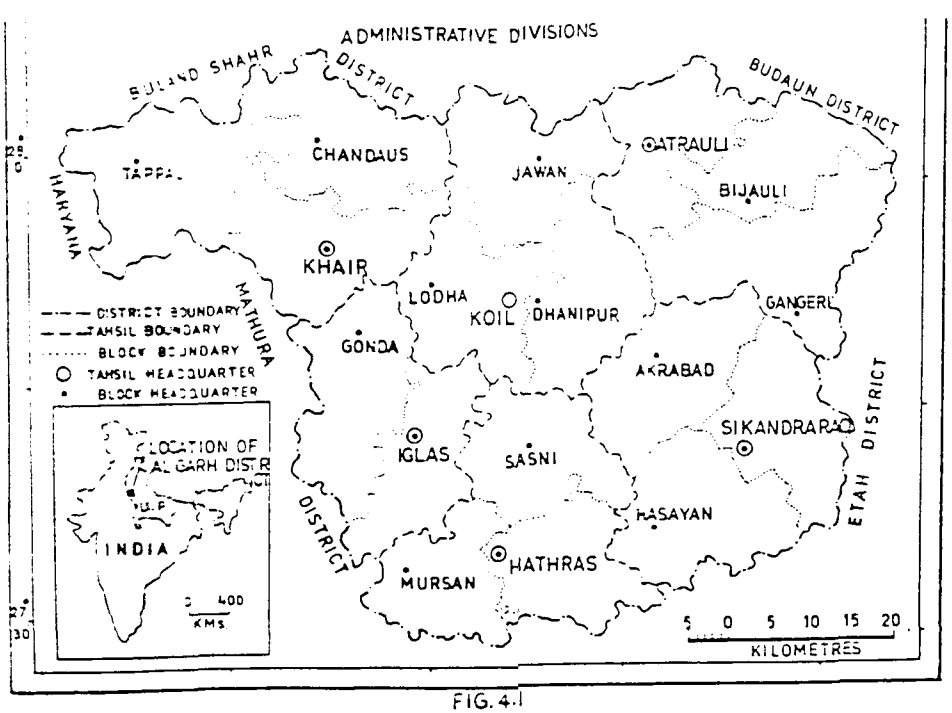
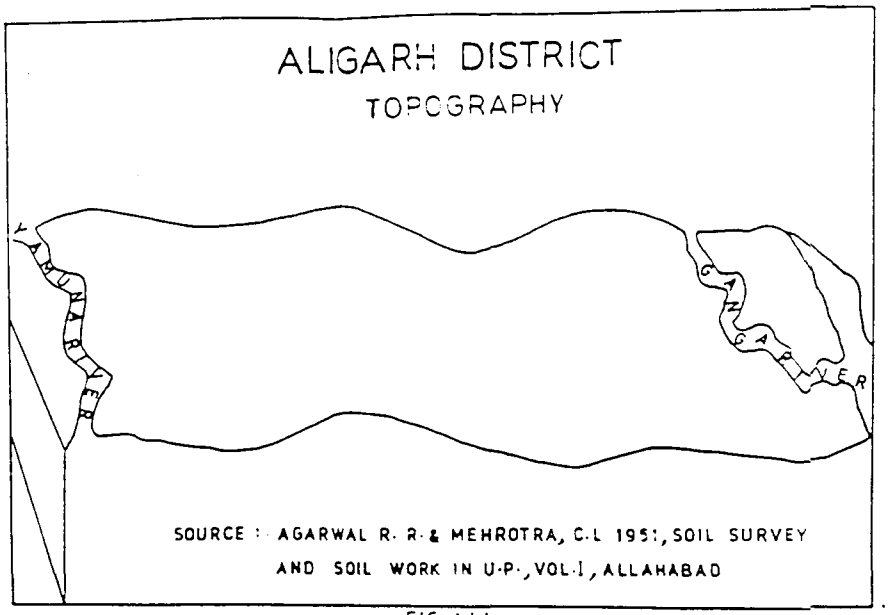
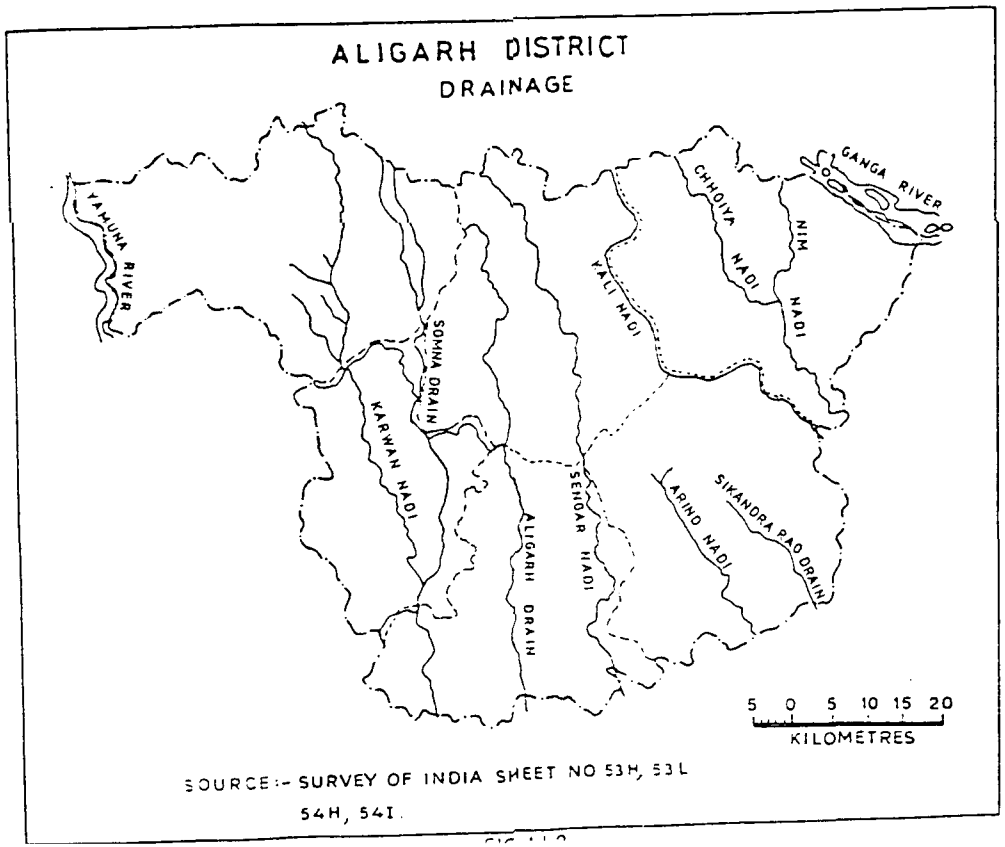


FIG. 4.1

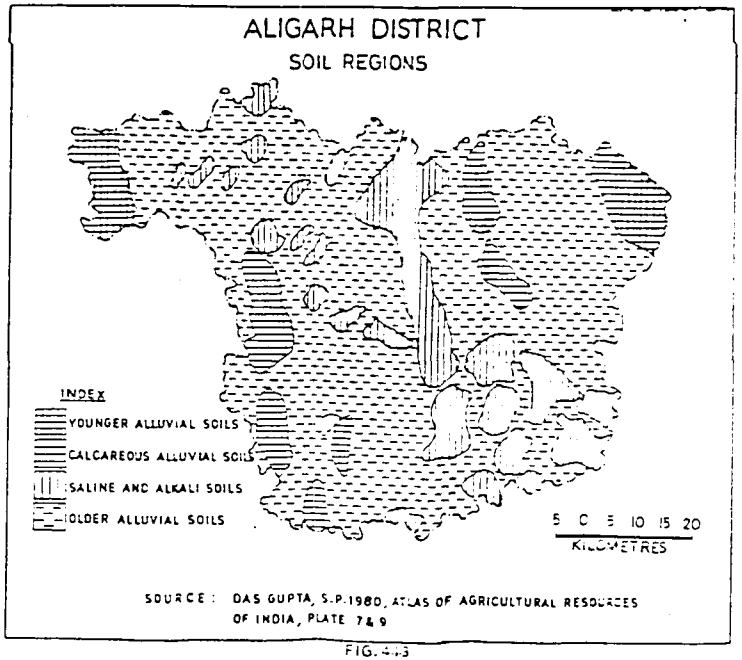


SOURCE : AGARWAL R. R. & MEHROTRA, C.L 1951, SOIL SURVEY AND SOIL WORK IN U.P., VOL.I, ALLAHABAD

FIG. 4.1.1



SOURCE:- SURVEY OF INDIA SHEET NO 53H, 53L 54H, 54I.



SOURCE : DAS GUPTA, S.P.1980, ATLAS OF AGRICULTURAL RESOURCES OF INDIA, PLATE 7 & 9

FIG. 4.1.3

The district has been divided into six tahsils, namely Koil, Sikandra Rao, Khair, Hathras, Atrauli and Iglas. These tahsils are further sub-divided into 17 blocks namely Jawan, Dhanipur, Lodha, Akrabad, Skikandra Rao, Hasayan, Khair, Chandaus, Tappal, Mursan, Sasni, Hathras, Atrauli, Gangeri, Bijauli,Iglas and Gonda, spread over 1,769 villages (Table 4.1).

Table 4.1 : Administrative Division of Aligarh district.

District	Tahsils	Block	No. of Villages
Aligarh	1. Koil	1. Jawan	109
		2. Dhanipur	106
		3. Lodha	143
	2. Sikandra Rao	1. Akrabad	89
		2. Sikandra Rao	68
		3. Hasayan	97
	3. Khair	1. Khair	97
		2. Chandaus	94
		3. Tappal	92
	4. Hathras	1. Mursan	103
		2. Sasni	115
		3. Hathras	160
	5. Atrauli	1. Atrauli	116
		2. Gangeri	101
		3. Bijauli	91
	6. Iglas	1. Iglas	105
		2. Gonda	83
Total	6	17	1,769

Source : District statistics Office, Aligarh(U.P.),1992.

Table 4.2 Land Utilization Statistics of Aligarh district - 1992

		(1)	(2)
1.	Reporting area	501,947	-
2.	Forests	3,212	0.64
3.	Usar and uncultivable lands	28,281	5.63
4.	Land put to non-agricultural use	41,346	8.24
5.	Permanent pastures and grasslands	2,644	0.52
6.	Culturable waste (as banjon)	9,706	1.93
7.	Land under miscellaneous trees and	-	-
8.	crops	1,245	0.25
8.	Current Fallow lands	13,204	2.63
9.	Other Fallow lands	12,829	2.55
10.	Net sown area	394,365	78.56
11.	Area sown more than once	251,396	50.08
12.	Total cropped area	645,674	163.72
13.	Net irrigated area	378.108	75.32
14.	Total irrigated area	525,335	104.65
15.	Irrigation by different sources	-	-
	i) Canals	73,262	19.38
	ii) Tubewells (State 5.73%, self 73.67%)	300,003	79.33
	iii) Other wells	3,988	1.05
	iv) Tanks, Lakes and Ponds	21	0.01
	v) Other Sources	834	0.22

Source : District Statistics Office, Aligarh (U.P.)

Note : 1. In hectares
2. Percentages to the Reporting area
A : From no. 2 to 14 are percentages to the reporting area.
B : Figures in the bracket (15) show the percentages to the net irrigated area.

4.1.1 PHYSICAL FEATURES

The topographic features of Aligarh district are similar to those found in other parts of the Ganga-Yamuna Doab. Physiographically, the district contains vast alluvial plains, having a gentle slope from north to south and south-east, and is drained by the rivers Ganga in the north-east and Yamuna in the north-west. Fig. 4.1.2 has been prepared for the ready understanding of the topography of Aligarh district.

From the low Khadar of the Ganga river in the east, the level of the district rises sharply to the high uplands which crown the old flood bank of the river Ganga and then descends inland gradually to a depression, drained by the Nim and Chhoiya nadis. Beyond which, it rises again to the bank of the Kali nadi. Along the right bank of the Kali nadi is another sandy to silty belt rising from the low and northen Khadar belt of that stream. Adjoining it, is a fertile belt of loam soil which sinks gradually into the broad central depression.

Through the centre of the district, a broad belt of low-lying land runs from north-west to south-east. This broad low-lying belt is infact the continuation of the belt which begins from the district of Meerut, passing through the Ghaziabad and Bulandshahr districts, enters Aligarh district from Koil tahsil in the north. The depression is narrow in

the north and gets wider towards the south and it eventually passes into the adjoining district of Etah. It is believed to be a part of a very expensive low-lying tract which runs through the centre of the doab parallel to the rivers Ganga and Yamuna. This tract is characterised by imperfect drainage and numerous jhils in which the surface water collects.

Beyond this depression, the surface rises again into a level plain known as western uplands. In the north-west, the general characteristics of the doab are maintained, loam alternating with clay in the depressions and with lighter ground on the banks of the few drainage channels, till finally comes the high cliff of the Yamuna. From here, the level drops to the Khadar of Yamuna. In the south-west of the district, Sandy tracts with practically no depressions are found.

Topographically, the district represents a shallow trough (Sauce-pan shape) like appearence. On the basis of topography the district could be divided into three divisions:

1. The Khadar plains found mainly along the river Ganga in the east and along the river Yamuna in the West.
2. The eastern and western uplands.
3. The central low-lying tract.

4.1.2 Drainage :

Aligarh district is well served by numerous rivers and drainage lines. There are two types of rivers. Some which have their sources in snow covered Himalayas namely, Ganga and Yamuna and are perennial and some are seasonal and reduced to insignificant water courses in dry seasons such as Karon, Sengar, and Rind (Fig. 4.1.3).

The Ganga having its source in the Himalayas, enters the great plain at Hardwar. From where, it flows south wards upto Bulandshahr district, then it enters Aligarh and takes a south easterly direction forming the northern boundary of the distrtict and separates Aligarh from Badaun. The rivers bring new alluvium. During the rainy season, the volume and velocity of the river is considerably increased because of which the low-lying areas are frequently inundated.

The river Yamuna has its source in the snowy peaks of the Himalayas, coming from the north it flows along the north-western border of Aligarh district and then moves towards south into Mathura and Agra district. The rivers banks rise /gradually with a gentle slope giving room to fertile expanses of alluvial lands known as Khadar.

The river Kali, rises in the north in district of Muzzaffar nagar and passing through Meerut and Bulandshahr enters into Aligarh from its northern borders. It is perennial

river, often rise in floods causing damage along its course.

Neem nadi is a small stream coming from the north and joins the Kali nadi on its left bank. Neem and Chhoiya nadis (rivulets) joining together and flow south ward as Neem nadi joined Kali nadi on its left bank. Neem is mainly a seasonal river. It is seldom dry in hot season and is in undated during the rainy season.

Sengar is a tributary of Yamuna which originates in the central depression, drawing water from numerous depressions. In its upper course the river is usually dry. Unless used as a canal escape during the cold and hot months.

Arid or Rind is another drainage channel which becomes large enough before joining Yamuna in Fatehpur district. The Rind flows through a shallow alluvial bed. In the years of unusual heavy rains, the lowlands along it are inundated and where the river recedes, it leaves off a rich layer of alluvial soil.

The river Karon or Karwan flows in a north south direction and passes throug Khair. Iglas and Hathras tahsils of Aligarh district. Further Southwards passing through Mathura it joins the river Yamuna near the city of Agra.

Apart from these, there are many jhils/but these Jhils are not a

permanent features. In koil tahsil the main jhil are found at Gursikaran, Ikri and Adhawan. The jhils are common at Ladhua, Suhauli and Gopi of Akrabad block. Many jhils are found at Hasayan block such as jhils of Hasayan, Bakayan, Nagla Sheikha etc. These jhils help to drain water from this district.

4.1.3 CLIMATE :

The climate of Aligarh district is similar to that of the Ganga-Yamuna Doab. This District experiences sevre cold in winter and oppressive not in summer. The minimum and maximum temperature was 2.7°C and 44.0°C in 1990-91. The annual average rainfall ranges from 60 to 75 cms. In 1990-91 it was 70.2°cm. The climate of Aligarh district is of tropical monsoon type, characterized by seasonal rhythm of the north-east and south-west monsoon. In general, the climate of Aligarh district may be divided into four seasons. such as;

i) Cold weather season (December to February)
ii) Hot weather season (March to Mid-June)
iii) Season of General Rains (Mid-June to Mid-september)
iv) Season of Retreating Monsoon (October to November)

The cold weather season is characterised by cold and dry air which blows from December to February. The sky is clear, and very rarely clouds are seen in the sky. This

season is associated with low temperature and high pressure. As a result this district comes under the influence of high pressure belt, frosts occur but not of great intensity. The maximum temperature is about 23°C and the minimum temperature ranges from 10°C to 12°C. The mean temperature for December and January is about 15°C and 12.2°C respectively. The temperature further fall downs because of cold waves, coming from the Himalayas. The days are relatively warm and nights are cold. During this season, the winds blow from west and northwest to east and southeast direction.The winds are generally light, dry and of continental in origin. Sometimes a little amount of rainfall occurs because of western depression. The temperature again begins to rise in February.

The hot weather season begins in March and lasts till mid-June. This season is characterized by an increase of temperature and decrease of pressure. The maximum and minimum temperatures in March are about 34°C and 15°C while in April the maximum and minimum temperatures are 38°C and 21°C. The maximum temperature for May and June is about 43.5°C and sometimes reached more than 46°C for few days. The days are characterized by intense heat, dry air, and associated with 24 percent relative humidity. In summer months hot dry winds blow with great velocity regularly and locally it is called Loo. The relative humidity is lowest and which is about 2 to 3

percent in the afternoon. The most peculiar phenomenon of this season is the occurrence of dust and Thunderstorms. They usually occur in the afternoon when the air movement is strongest. They are accompanied by strong winds. Thunder, blinding dust and rarely sometimes by rains. A little rainfall occurs accompanied by thunderstorms.

In the season of general rains the humid oceanic currents reach the northern part of India because of the excessive heat prevailing over this region and causing low pressure. As a result, moisture laden winds coming from ocean to land area, causing rainfall in this region by the middle of June. The season is accompanied by fall in temperature, cool air and rainfall. The temperature falldowns from 40°C and 27°C in June to 34°C and 25°C in July. The relative humidity, increases from 30 percent in May to 74 percent at the end of June and 84 percent in July and August. The sky is overcast. Actually in Aligarh district the rain occurs in the last week of June or first week of July and continues till the end of september or early October. About 90 percent rainfall occurs in this season. A peculiar characteristic is that rain does not fall continuously; after two or three days of continues rainfall, there is a break or a period of day spell for a week or ten days, The average rainfall is about 70 cm annually. The rainfall is unevenly

distributed and is heavier in the east and central part than west. The Atrauli tahsil in the north east received an average rainfall of about 72 cm and Iglas in the southeast got about 57 cm. Sikandra Rao and Koil tahsils received an average of 68 cm and 67 cm rainfall respectively. Similarly Hathras and Khair tahsils received 63.5 and 60.5 cm of rainfall respectively.

In the season of retreating Monsoon, the weather is hot and sticky and temperature rises but starts falling by the end of October. The maximum and minimum temperature recorded in September (1992) was 33°C and 24°C respectively. This is marked by clean sky, relative humidity is to about 47 percent and slight rainfall. Temperature is likely to be high during day time and low at night.

4.1.4 SOILS :

The soils of Aligarh district is alluvial and is divided into two broad sub-divisions, i.e. old and new alluvium. The new alluvim is confined to the flood plains of the rivers and their tributaries while the old alluvium is represented by the level plain above the flood level of the main rivers and their tributaries. These soils differ considerably in their texture and consistancy, ranging from sands through loams and silts to heavy clay that are ill-drained

and sometimes charged with injurious salts known is reh. The great soil tracts of the district are found almost parallel to the rivers. From the east of the river Ganga, the soil varies from sandy to sandy loam and clayey loam upto the middle of the district. Further westwards there is again the sandy loam tract which finally merges into the sandy bed of the river Yamuna.

Different criterias have been applied by different workers to classify the soils of Aligarh district. First group of workers (Agarwal and Mehrotra, 1951 and 1952) classified the soils into six categories. The second group of workers (Dasgupta, 1980) classified these soils into four categories, while the third groups of workers (soil survey Department project office. Aligarh, 1984) classified these soils into eight categories.

The classification of soils done by Dasgupta in 1980 has been discussed here (Fig. 4.1.4).

i) Younger alluvial soils
ii) Calcareous Alluvial soils
iii) Saline and alkali soils
iv) Older Alluvial soils

(i) Younger Alluvial Soils :

These soils occupy narrow belts in the eastern corner

along the course of Ganga and in the western corner along the course of Yamuna. These tracts receive every year new deposits of silts and sands due to floods in the rivers Ganga and Yamuna. The colour of these soils varies from light grey to ash grey and dark grey. While the texture is sandy to silty loam. The water table is high and usually near the surface. During the periods of rains, it generally remains on the surface. During the summer months wide spread salt enflorescence on the surface may be seen. The drainage is imperfect, restricted and poor. The soils are saline in nature and alkali in reaction. The soils are not generally mature and the profile has many layers of younger alluvium, deposited over one another during floods in the Ganga and Yamuna. Agriculturally, the soils are not well developed because of floods, water logging and saline efflorescences but wherever cultivation is possible, the soil is fertile and good crops are raised. Such lands are characterized as good lands. Most of the land is devoted to the cultivation of some salt-tolerant crops such as sugarcane, barley, paddy and so on.

ii) Calcareous Alluvial soils :

These soils are found in Iglas tahsil, Mursan block of Hathras tahsil and Atrauli and Gangeri blocks of Atrauli tahsil. In Iglas tahsil, they cover mainly the Gonda block.

In Atrauli tahsil they occupy narrow belts in the western part of Atrauli and Gangeri blocks along the course of Kali nadi. In Iglas block, then are fouund in the South-western part, while in Mursan block they are found in Western, eastern and southern parts. The texture of such soils varies from sandy to sandy loam and small sandy ridges especially in Iglas and Hathras tahsils are found. These soils are poor in organic matter and other plant nutrients and contain considerable amount of soluble salts. They are rich in calcium carbonate because of which they are called as calcareous alluvial soils. For agricultural purposes, they are not good soils due to poor in organic matter, sandy nature and presence of soluble salts. Therefore, these soils are mainly suitable for forestry and grazing.

iii) Saline and Alkali soils :

It is found that mainly due to imperfect drainage, the district containts vast areas of such soils which are either saline and alkaline or have a tendency towards salinization and alkalinization. These soils are widely distributed in the tahsils of Sikandra Rao and Koil and in some parts of Khair, Hathras and Iglas tahsils. The texture of these soils varies from loam to clayey loam, These soils have a high soluble salt percentage and PH is usually above 8.5. During the rainy season the soil remains submerged and becomes

impermeable when finally it dries up. These soils cannot be utilized without reclamation and management, therefore, they are characterized as poor lands. At some places, where the intensity of salt is low. Some salt tolerant grasses and crops such as paddy, barley and sugarcane are cultivated but the yields are very low.

iv) Older Alluvium :

This soil type covers most of the area of the district The soil profile is mature and the soil profile is mature and the soil texture varies from good quality loam to sandy loam. It is a deep, well drained, neutral to slightly acidic soil and it can be easily ploughed and cultivated. The soil is very fertile and infact some of the highest yields in the district are obtained from this soil. The main crops are Jowar, bajra and maize during the Kharif season. Mixed cropping of bajra and arhar is also practised. During the rabi season, barley and wheat are grown. Pea is also grown on these soils. Agriculturally, these soils are characterized as very goodlands.

4.2 *HUMAN ENVIRONMENT*

4.2.1 Distribution of Population :

A perusal of table 4.3 shows that the population of Aligarh district, according to 1991 census was 3,295,986. Out of which male and female were 1,781,752 and 1,504,924 respectively. The average density of population was 657 persons per Sq.Km.

From table 4.3 it is observed that the population growth rate has not been similar since 1847 to 1991. The growth rate has been slow even negative from 1847 to 1921 except during 1847-1853 when the population growth rate was 4.66 percent. From 1865 to 1872 and 1891 to 1901, the growth rate was 13.65 and 13.12 percent respectively. The growth rate increased tremendously from 1931 to 1991 census. During 1921-31 it was 9.39 percent and 0.939 percent per annum from 1971 to 1981 and 1981- to 1991, the growth rates were 17.98 and 21.87 percent respectively. The main reasons for rapid growth of population would be the rapid development of agricultral facilities and industrialization.

Table 4.3 : Distribution, density and growth of population in Aligarh district

Year	Male	Female	Total population	Growth rate (percent)	Average annual growth rate (percent)	Density (per Sq.Km.)
1	2	3	4	5	6	7
1847	-	-	739,356	-	-	146
1853	545,904	480,786	1,026,690	27.98	4.660	203
1865	500,746	426,008	926,754	-10.78	-0.900	184
1872	577,328	495,928	1,073,256	13.65	1.950	213
1881	551,279	469,908	1,021,187	- 5.09	-0.570	203
1891	558,743	484,429	1,043,172	2.10	0.210	207
1901	634,872	565,950	1,200,822	13.12	1.310	238
1911	629,524	536,156	1,165,680	- 3.01	- 0.300	231
1921	575,379	486,366	1,061,745	- 0.98	- 0.098	210
1931	636,037	535,708	1,171,745	9.39	0.939	232
1941	744,867	627,744	1,372,641	14.63	1.463	273
1951	831,133	712,373	1,543,506	11,07	1.107	306
1961	948,568	816,707	1,765,275	12.56	1.256	349
1971	1398,976	960,386	2,111,829	16.41	1.641	420
1981	1398,976	1,175,949	2,574,925	17.98	1.798	513
1991	1781,752	1,504,924	3,295,986	21.87	2.187	657

Source : 1. Gazetteer of Aligarh District, 1926.
2. Census of India 1911-1991.

Table 4.4 shows that there is preponderance of rural population. About 75 percent are rural and they are engaged primarily in agricultural activities. The high density of rural population is found at Gangeri (556 persons per sq.km), Atrauli (580 persons per sq.km). Mursan (583 persons per sq.km), Hathras (554 persons per sq.km), Sasni (572 persons per Sq. km) and Jawan (608 persons per sq.km). The medium density of rural population is found at Lodha (494 persons per sq km), Dhanipur (486 persons per sq.km), Gonda (509 persons per Sq.km), Bijauli (540 persons per Sq. km). The low density of rural population is located at Hasayan (451 persons per Sq.km), Akrabad (404 persons per Sq.km), Iglas (414 persons per sq.km), Khair (450 persons per sq.km), Chandaus (458 persons per sq. km) and Tappal (408 persons per sq.km).

Table 4.4 : Blockwise distribution and density of Rural population in Aligarh District (1991,census).

Blocks	Area (Sq.Km.)	Population	Density (Sq.Km.)
1	2	3	4
Tappal	381	155,646	408
Chandaus	324	148,406	458
Khair	321	144,360	450
Jawan	316	192,282	608
Lodha	324	160,114	494
Dhanipur	297	144,371	486
Gonda	272	138,455	509
Iglas	307	127,126	414
Sasni	272	155,639	572
Hathras	236	130,723	554
Mursan	232	135,281	583
Atrauli	283	164,313	580
Bijauli	263	132,593	504
Gangeri	353	196,257	556
Akrabad	303	122,466	404
Sikandra Rao	267	114,721	430
Hasayan	268	120,826	451
17 Blocks	5019	2,483,579	495

Source : Census of India 1991, Final population Totals. Series : 1 Paper 1 of 1992, Vol. II

4.2.2 Literacy :

The male and female literacy are much higher in urban areas as compared to rural area. Table 4.5 is showing literacy rate in Aligarh district. It seems that male and female literacy rate are increasing.Since 1961 to 1991.But there is a wide gap between male and female literacy rates.

Table 4.5 : Literacy Rate in Aligarh district

Year	Male	Female	Rate of literacy to the total population(percent)
1	2	3	4
1961	282,958 (16.03%)	66.174 (3.75%)	19.78
1971	404,057 (19.13%)	121,483 (5.76%)	24.89
1981	616.100 (23.93%)	191.023 (7.42%)	31.34
1991	859,826 (26.1%)	327,678 (9.94%)	36.02

Note : Percentages in the brackets are to the total population.

Source : Census of India (1961-1991).

4.2.3 ECONOMIC CLASSIFICATION OF POPULATION

Economic classification or occupational structure of population generally refers to proportional distribution of population under specific economic activities in any region.

Table 4.6 is showing the economic classification of population of Aligarh district. It is seen that a large proportion of work force are engaged in agriculture, manufacturing, processing, servicing, trade and commerce and other services. This table also shows that percentage of agricultural labourers, construction, trade and commerce to the total workers has increased since 1951 to 1991.

From table 4.7 it is seen that percentage of cultivator to the total workers ranges between 33 to 65. The blocks of Lodha, Dhanipur, Jawan, Sasni and Hathras have less than 40 percent of cultivators, the blocks of Atrauli, Iglas, Gonda, Khair, Chandaus and Mursan have less than 50 percent, the blocks of Gangeri, Tappal, Akrabad and Hasayan have less than 60 percent and the blocks of Bijauli and Sikandra Rao have less than 65 percent of cultivators to the total workers. The percentage of agricultural labours to the total workers also ranges between 17 to 34.

Table 4.6 : Economic classification of population of Aligarh district (1951-91)

Workers	Year				
	1951	1961	1971	1981	1991
1	2	3	4	5	6
1. Cultivators	242,015	274,592	282,735	329,349	370,395
2. Percentage of cultivators to total workers	48.96	49.46	49.00	48.19	37.52
3. Agricultural labourers	49,528	55,140	109,469	130,490	207,694
4. Percentage of agricultural labourers to total workers	10.02	9.93	18.97	19.09	21.04
5. Livestock forestry Fishing,Hunting and Plantations	4,772	5,994	3,522	3,441	8,830
6. Percentage of livestock,forestry Fishing, Hunting and total workers	0.96	1.08	0.61	0.50	0.89
7. Mining and quarrying	-	903	247	69	135
8. Percentage of Mining and Quarrying to total workers	-	0.16	0.04	0.01	0.013
9. Manufacturing processing,servicing and repairs	67,280	76,235	59,209	78,416	102,260
10. Percentage of manufacturing processing and repairs to total workers.	13.61	13.73	10.26	11.47	10.36
11. Construction	-	-	5,298	7,227	14,085
12. Percentage of construction to total workers	-	-	0.92	1.06	1.42

Contd....

Contd....Table 4.6

1	2	3	4	5	6
13. Trade and commerce	37,286	34,995	32,689	41,246	71,710
14. Percentage of trade and commerce to total workers	7,54	6,30	5.66	6.03	7.26
15. Transport,storage and communication	11,110	10,533	14,631	17,729	22,799
16. Percentage of tran-port, storage and communication total workers	2.25	1.89	2.53	2.60	2.30
17. Other services	82,280	96,744	69,112	76,411	104,576
18. Percentage of other services to total workers	16.64	17.42	11.97	11.18	10.60
19. Total workers	494,271	555,137	576,952	683,378	987,114
II. Non-workers	1,049,235	1,210,138	1,534,877	1,886,355	2,355,968

Source : Sankhiyaki Patrika 1992, District Statistics office, Aligarh (U.P.).

Table 4.7 : Blockwaise occupational structure of population in Aligrh District, 1991 census

Blocks	Total Population	%age of population to total Rural Population	Total workers	Cultivators	%age of cultivators to the total workers	Agricultural Labourers	%age of Agricultural labourers to the total workers	Household workers	%age of household workers to the total workers	Other and Marginal workers	%age of other and marginal workers to the total workers	%age of workers to the total Population
1. Atrauli	164,313	6.61	55,572	27,233	49.00	10,735	19.3	2,352	4.23	12,917	23.24	33.82
2. Gangeri	196,257	7.90	63,462	37,737	59.5	10,669	16.8	2,131	3.36	9,966	15.70	32.33
3. Bijauli	132,593	5.34	43,461	28,131	64.7	7,530	17.3	1,057	2.43	5,373	12.36	32.77
4. Iglas	127,126	5.12	38,871	17,857	46.0	11,579	29.8	1,467	3.77	5,763	17.82	30.57
5. Gonda	138,455	5.57	52,049	22,480	43.2	11,457	22.0	1,578	3.00	14,302	27,47	37.60
6. Jawan	192,282	7.74	52,891	19,863	37.5	12,821	24.2	3,277	6.20	12,468	23.57	27.50
7. Dhanipur	144,371	5.81	47,212	17,313	36.7	14,953	31.7	2,643	5.60	9,710	20.56	32.70
8. Lodha	160,114	6,44	49,718	16,295	32.8	11,846	23.8	5,616	11.30	10,964	22.00	31.00
9. Khair	144,360	5.81	43,516	20,297	46.6	12,148	27.9	1,608	3.70	7,425	17.00	30.15
10. Chandaus	148,406	5.97	46.026	20,058	43.6	11,110	24.1	2,473	5.37	9,235	20.10	31.00
11. Tappal	155,646	6.26	50,292	25,642	51.0	11,687	23.2	1,553	3.10	9,387	18.66	32.31
12. Akrabad	122,466	4.93	35,932	18,759	52.2	8,866	24.7	1,567	4.36	4,093	11.40	29.34
13. Sikandra Rao	114,721	4.62	33,040	20,045	60.6	7,928	24.0	1,005	3.00	2,490	7.53	28.80
14. Hasayan	120,826	4.86	35,797	19,035	53.2	10,593	29.6	1,429	4.00	3,405	9.51	29.62
15. Mursan	135,281	5.44	39,547	16,893	42.7	12,550	31.7	2,816	7.10	4,928	12.46	29.23
16. Sasni	155,639	6.27	44,502	17,068	38.3	15,192	34.1	3,852	8.65	5,146	11.56	28.60
17. Hathras	130,723	5.26	36,833	14,485	39.3	12,152	33.0	2,857	7.75	4,219	11.45	28.17
Total Rural	2,483,579	75.35%	768,720 77.87% of Dis.Total	359,241	46.73	193,836	25.2	39,281	5.1	131,791	17.14	30.95
Total urban	812,403		218,394 22.13% of Dist.total workers	11,154	5.10	13,858	6.34	62,979	28.83	57,415	26.28	26.88
Total district Population	3,295,982		987,114	370,395		207,694		189,206		189,206		28.91

Source : Census of India 1991, Final population totals
Series : 1 Table 1 of 1992

4.2.4 DISTRIBUTION OF LANDHOLDINGS IN ALIGARH DISTRICT

Table 4.8 is showing the distribution of landholdings in Aligarh district from 1970-71 to 1990-91. Maximum number of holdings belong to marginal category followed by small, Semi-medium, medium and large. An increase in the number of marginal (from 49 percent to 57 percent) and small (20 percent to 21 percent) holdings was observed while a decrease in the number of semi-medium (from 14 percent to 10 percent), medium (from 12 percent to 8 percent) and large (from 6 percent to 4 percent) was bbserved during the last twenty years. Regarding the total area operated, maximum area was under the large farms followed by medium, semi-medium, small and marginal.

Table 4.8 : Distribution of land holdings in Aligarh district (1970-71 to 1990-91)

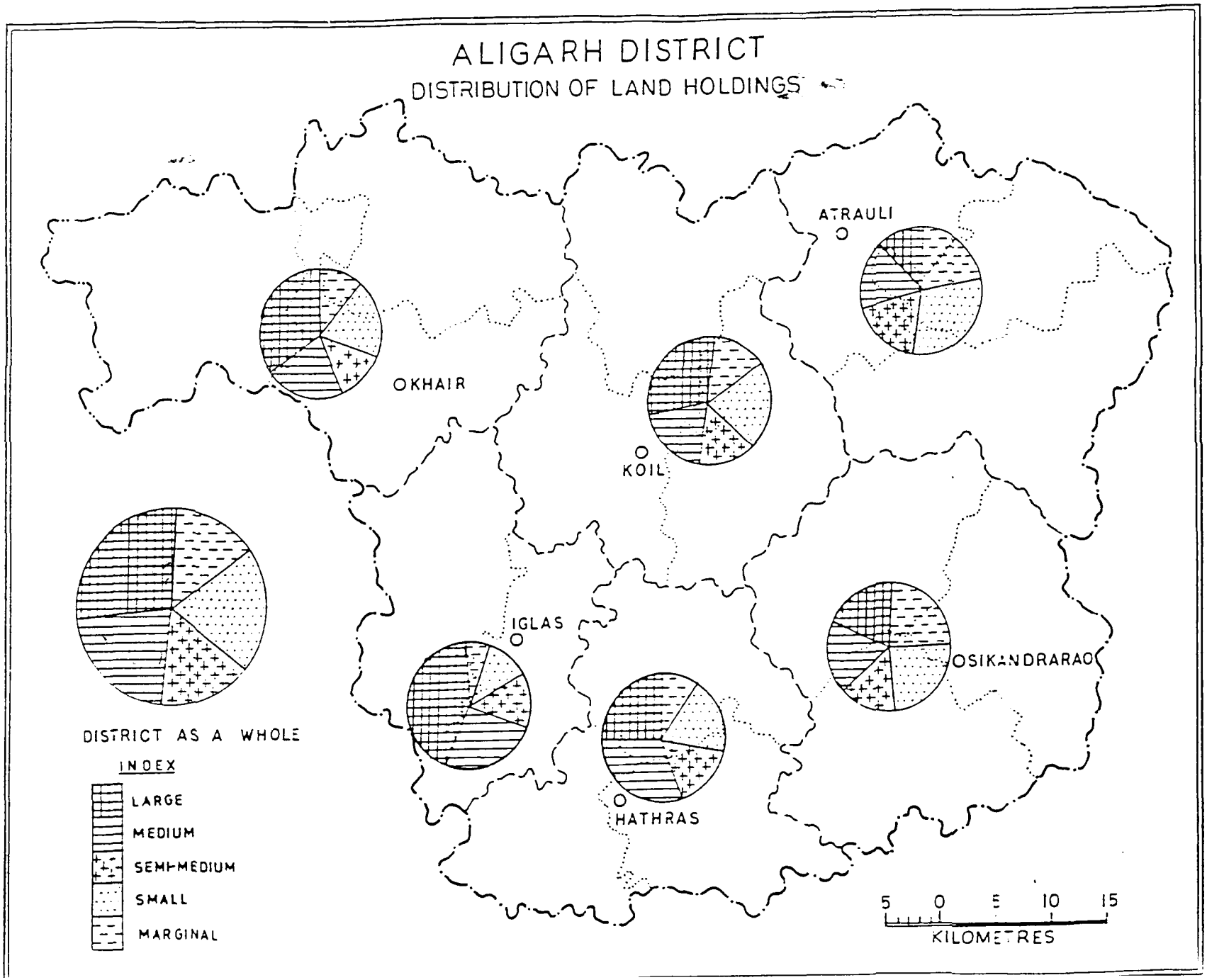
Categories	1970-71		1980-81		1990-91		1970-71	1980-81	1990-91
	No. of holdings	Total area operated (hec)	No. of holdings	Total area operated (hec)	No. of holdings	Total area operated (hec)	average size of operated area per holding (hec)	average size of operated area per holding (hec)	average size of operated area per holding (hec)
Marginal (less than 1 hec)	109,270 (48.97%)	45,286 (11.1%)	132,589 (52.8%)	50,927 (12.45%)	161,138 (56.9%)	56,993 (13.98%)	0.41	0.38	0.35
Small (1-2 hectares)	45,350 (20.32%)	60,745 (14.84%)	55,844 (22.23%)	70,990 (17.35%)	59,739 (21.1%)	85,406 (20.95%)	1.34	1.27	1.44
Semi-medium (2-4 hectares)	30,197 (13.53%)	65,582 (16.0%)	26,408 (10.5%)	60,937 (14.9%)	28,832 (10.18%)	65,128 (15.98%)	2.17	2.31	2.26
Medium (4-10 hectares)	25,765, (11.55%)	105,325 (25.73%)	25,006 (9.95%)	104,465 (25.53%)	22,820 (8.0%)	92,002 (22.57%)	4.10	4.17	4.03
Large (10 and above)	12,568 (5.7%)	135,462 (33.1%)	11,370 (4.52%)	121,821 (29.8%)	10,741 (3.8%)	108,214 (26.54%)	10.8	10.71	10.10
Total	223,150	409,400	251,217	409,140	283,270	407,743			
	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)			

Source : Sankhiyaki Patrika, 1974, 1984, 1992, District Statistics office, Aligarh (U.P.)

Table 4.9 is showing the decadal variations in the number of holding and operated area from 1970-71 to 1980-81, 1980-81 to 1990-91 and 1970-71 to 1990-91. It is seen that the number of holdings increased by 11.71, 11.3 and 21.22 percent respectively, and operational holding decreased by 0.06, 0.34 and 0.41 percent respectively. This is due to the faster growth of population, heavy pressure on land, construction of building and expansion of new settlement.

Table 4.10 and Fig. 4.2 showing tahsil wise distribution of operational holdings in Aligarh district. It is observed that maximum number of marginal farms are found in Sikandra Rao (27.1 percent) followed by Atrauli (24.61 percent), Koil (16.81 percent), Khair (16.1 percent), Hathras (9.5 percent) and Iglas (5.85 percent).

Maximum large farms are found in Khair tahsil (26.84%), followed by Iglas (22.27%), Koil (18.22%), Hathras (14.14%), Sikandra Rao (10.72%) and Atrauli tahsil (7.8%).


ALIGARH DISTRICT
DISTRIBUTION OF LAND HOLDINGS
ATRAULI
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HATHRAS
OSIKANDRARAO
DISTRICT AS A WHOLE
INDEX
LARGE
MEDIUM
SEMI-MEDIUM
SMALL
MARGINAL
5 0 5 10 15
KILOMETRES

Table 4.9 Decadal Variations of number of holdings and operated area

Year	No. of holdings	Total Area operated (hec)	Variations of No. of holdings			Variations of total area operated (hec)			Percentage of variations of no. of holdings			Percentage of variations of total area operated		
			1970-71 to 1980-81	1980-81 to 1990-91	1970-71 to 1990-91	1970-71 to 1980-81	1980-81 to 1990-91	1970-71 to 1990-91	1970-71 to 1980-81	1980-81 to 1990-91	1970-71 to 1990-91	1970-71 to 1980-81	1980-81 to 1990-91	1970-71 to 1990-91
1970-71	223,150	409,400												
1980-81	251,217	409,140	28,067			260			+ 11.17			- 0.06		
1990-91	283,270	407,743		32,053	60,120		-1,397	-1,657		+ 11.3	+ 21.22		- 0.34	- 0.41

It is computed from Table 4.7

Table 4.10 : Tahsil wise Distribution of operational holdings in Aligarh district 1990-91 (in hectares)

Tahsil/land holding	Marginal Below 1	Small 1 - 2	Semi-medium 2 - 4	Medium 4 - 10	large 10 and above
1. Atrauli	14,028 (24.61%)	20,691 (24.2%)	12,670 (19.4%)	10,941 (11.9%)	8,429 (7.8%)
2. Iglas	3,335 (5.85%)	6,245 (7.00%)	8,147 (12.4%)	15,051 (16.3%)	24,100 (22.27%)
3. Koil	9,585 (16.81%)	14,939 (17.9%)	10,544 (16.37%)	13,986 (15.2%)	19,718 (18.22%)
4. Khair	9,164 (16.1%)	16,952 (19.8%)	13,942 (21.4%)	20,152 (21.9%)	29,060 (26.84%)
5. Sikandra Rao	15,450 (27.1%)	15,470 (18.1%)	9,702 (14.9%)	12,023 (13.1%)	11,604 (10.72%)
6. Hathras	5,432 (9.5%)	11,109 (13.0%)	10,123 (15.53)	19,849 (21.6%)	15,303 (14.14%)
Total	56,993 (100%)	85,406 (100%)	65,128 (100%)	92,002 (100%)	108,214 (100%)

Note : Figures of percentages in the brackets are to the total of operational holdings

Source : Sankhiyaki Patrika, 1990-91, District Statistics office, Aligarh (U.P.)

4.3 AGRICULTURAL BACKGROUND

Out of the total geographical area of 501, 947 hectares, about 77.66 percent is under net cultivation and 127.89 percent is total cultivated area, of the net cultivated area, 93.38 percent is net irrigated, of which 74.20 percent is under tubewells, 24.49 percent is under canal and the rest is irrigated by other sources.

The district was chosen for intensive Agricultural District programme in 1960-61 which envisaged intermediate increase in production through provison of inputs including irrigation, fertilizers, high yielding varieties of seeds, modern implements, pesticides etc. The district recorded an increase of 65 percent in net irrigated area, 90 percent in total irrigated area, 3,000 percent in fertilizer consumption, 1,000 percent in number of improved implements used and 52 percent in area under high yielding varieties of seeds from 1960-61 to 1990-91.

As far as agricultural cropping pattern is concerned it is said that this district has a diversified agricultural cropping pattern with a wide range of crops (Singh, 1981). There are three main agricultural seasons; The Kharif is the season ofsummer crops. Sowing in this season begins with the first rains of the south-west monsoon, usually in June and it extends well into July. The Kharif crops are reaped between

September and December. The rabi is the season of winter crops. These crops differ in kind from the Kharif crops and requires cool wheather and only a moderate supply of water. These crops are usually sown in October and November and harvested in April and May. Besides, there is an intermediate crop season known as Zaid. The principal crops grown during this season are moong, green gram etc.

There are many types of crops grown in this district but the main crops are wheat, barley, rice, bajra, maize, Jowar, pulses (gram, peas and arhar), cotton, sugarcane, potato and oilseeds.

The Pre-Green Revolution period was the period of traditional agriculture. Agriculture practices were carried out by primitive method. Farmers did not know much about soil, water conservation and land management practices, and the use of fertilizers, Low capital investment in agriculture resulted in low yields and low returns. About 85.3 percent of the cultivated land was under food crops and 14.7 percent was under oilseeds, Sugarcane and potato. With the adoption of intensive agricultural District programme (Launched in 1961-62) in this district there has been some increase in area under wheat and maize.

The average yield of wheat, barley, maize, bajra, was 11.42, 10.01, 6.42 and 4.97 quintal per hectare respectively. Thus, there was low production during this period. The main reason was traditional bound technology, primitive methods of

production of crops and less use of inputs.At the end of 1964 when new technology was introduced, the educated farmers were attracted towards it, Mass media, visits to the farms by experts and demonstration had finally helped in changing the attitude of the farmers.

During the post-green revolution period a remarkable change was noticed with the adoption of new technology including modern agricultural implements, HYVS, adequate amount of chemical fertilizers, required amount of pesticides and insecticides better irrigation facilities etc brought drastic change in agricultural production of wheat, maize, bajra and paddy, Their was an increase of 170.25 percent in food grain production from 1961-64. to 1989-92 . The area, production and yield under wheat increased to 127.22, 445.77 and 140.17 percent respectively.Similarly there was an increase in area,production and yield of maize to 31.32, 182.64 and 114.02 percent respectively. An increasing trend in area, production and yield of rice to 50.95, 173.54 and 83.58 percent was noticed. The area under pulses decreased (-25.17 percent) because of low prices and low yields. The area under oilseeds, bajra, sugarcane and potato increased continuously The production of potato increased due to the introduction of HYV seeds of potato.Thus, it is observed that Aligarh district has made a tremendous development in agricultural sector.

The total production of food grains of Aligarh district have registered an increase to about 36.56 percent from 1980-82 to 1990-92. There was an increase of production of wheat,rice, barley, bajra, maize in all the block. The total production of pulses have registered an increase.Similarly the total production of non-food grains have shown an increase to about 50 percent. The production of oilseeds, sugarcane, potato also increased in the last 10 years.

There has been an accelerating growth of average yield of total food grains from 1980-82 to 1990-92. The main reason was the adoption of new technology and rapid adoption of HYVS, yield level of total foodgrains has increase to about 40.05 percent in the last 10 years. The average yield of wheat, rice, barley, bajra and maize has increased to 18.05, 54.35, 48.35, 83.33 and 97.42 percent respectively. There was a marked increase in yield of pulses, to about 40.1 percent. In case of non-food grains, the average growth of yield was about 4.75 percent. The yield of oilseeds, sugarcane and potato was about 48.2, 23.5 and 7.0 percent respectively.

Therefore, an increasing trend of yield of foodgrains and non-food grains constituted the major and predominant component of growth of agriculture in this district. The production of various crops increased to a larger extent than the area under different crops.

CHAPTER - FIVE

The present chapter is based on field work. The author is trying to find out a relationship between land holdings and agricultural productivity with the help of qualitative and least square fitting methods. Data of general aspects of sampled farms consists of the number of sampled farms. total family members, literacy and educational status. Data regarding the agricultural background of the sampled farms includes total land holdings, average size of holdings, total operational holdings, intensity of cultivation, number of family members engaged in agriculture and soil type. Data regarding agricultural inputs used on the sampled farms includes irrigation, fertilizer, HYVS, improved agricultural implements insecticides and pesticides and labour. Data regarding agricultural production on the sampled farms includes area under important crops, yield and total production, marketing of the produce, price per quintal, total value of agricultural production. These were collected through intensive field work on the basis of questionnaire and interview of the farmers having different size of landloddings. The survey in the study area was conducted during the months of July, August and September, 1993.

5.1 SAMPLE DESIGN

Villages from study area were selected randomly from each block of the district. The study area consists of 17 blocks and 2 villages from each block were selected

Table 5.1 : Sampled villages of Aligarh District (1993).

No. of Blocks	Name of Blocks	No. of Village selected	Name of the Village	No.of sampled Farms
1	2	3	4	5
1.	Jawan	2	Siakhas Jamalpur	10 10
2.	Dhanipur	2	Panethi Asadpur Kayaw	10 10
3.	Lodha	2	Nahra Nagla Mansingh	10 10
4.	Akrabad	2	Sikandarpur Kathera	10 10
5.	Sikandra Rao	2	Papal gawan Dah gawan	10 10
6.	Hasayan	2	Kalupura Nagla Dali	10 10
7.	Khair	2	Narainpur Benkar	10 10
8.	Chandaus	2	Cheeti Deta Khurd	10 10
9	Tappal	2	Khaira Kishan Simrothi	10 10
10.	Mursan	2	Nagla Gajua Gopalpur	10 10
11.	Sasni	2	Sathia Chhattarpur	10 10
12.	Hathras	2	Lahrpur Bir nagar	10 10
13.	Atrauli	2	Pendra Chalakpur	10 10
14.	Gangeri	2	Tikata Pipri	10 10
15.	Bijauli	2	Khandwa Tebthu	10 10
16.	Iglas	1	Taherpur Hastpur	10 10
17.	Gonda	2	Pipli Dingsari	10 10
Total 17 Blocks		34 villages		340 farms

Source : Field Survey (1993).

ALIGARH DISTRICT

LOCATION OF SAMPLED VILLAGES

and surveyed. Hence, a total of 34 villages were surveyed. From every village 10 farms having different size of land holdings were selected. Thus 340 farms having different size of landholdings (marginal farms having less than 1 hectare land, small farms having 1 to 2 hectares land, semi-medium farms having 2 hectares, medium farms having 4 to 10 hectares and large farms having more than 10 hectares of land) were survyed. Table 5.1 and figure 5.1 is showing the number, names and location of the sampled villages.

This chapter consists of five sections. Section first is devoted to the study of the general aspects of sampled farms. Section second deals with agricultural background, section third is dealing with the use of agricultural inputs and Section four deals with agricultural production on the sampled farms. In section five relationship between land holdings and agricultural productivity has been assessed and discussed.

5.2 GENERAL ASPECTS OF SAMPLED FARMS

Table 5.2 is showing the general aspects of the sampled farms. Of the 340 sampled farmers, 52 were marginal farmers, 60 small farmers, 76 semi-medium, 95 medium and 57 large farmers. About 80 percent were literate. Amongst the literate nearly 40 per cent of the medium farmers, 27 per cent of the large farmers and 24 per cent of the

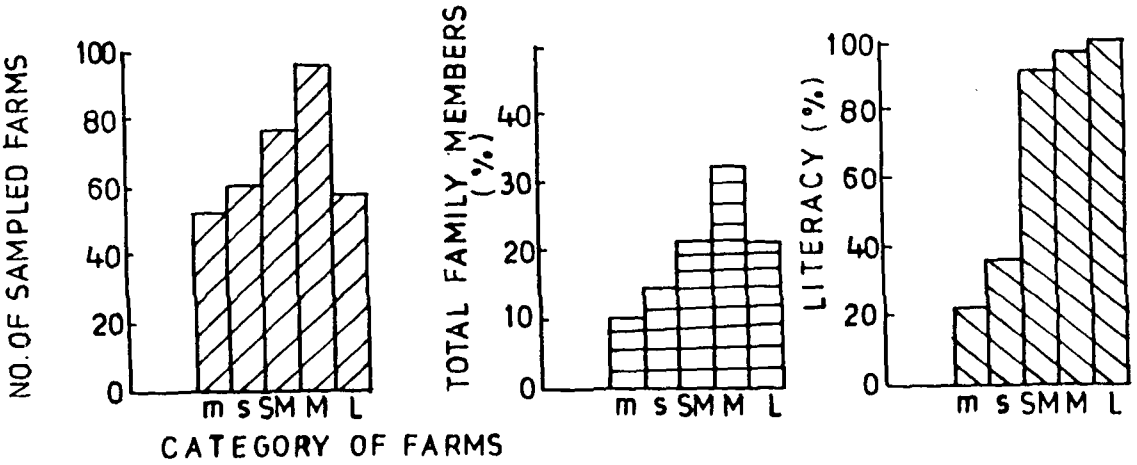
Table 5.2 : General Aspects of Sampled farms of Aligarh District.

:egory	No. of sampled farms	Total family members	Primary	Secondary	High School	Inter-mediate	Gradua-tion	Post gra-dua-tion	Total lite-rate persons	Percentage of literate persons to the total literate persons
1	2	3	4	5	6	7	8	9	10	11
:ginal farms ·1 hec.)	52	311 (10.2%)	66 (94.3%)	4 (5.7%)	-	-	-	-	70 (22.5%)	2.9
:ll farms ·2 hec.)	60	446 (14.6%)	100 (62.5%)	35 (21.8%)	19 (11.9%)	4 (2.5%)	1 (0.6%)	1 (0.6%)	160 (35.8%)	6.6
:i-medium :ms ·4 hec.)	76	642 (21.06%)	250 (42.6%)	156 (26.6%)	85 (14.5%)	65 (11.1%)	25 (4.2%)	5 (0.8%)	586 (91.2%)	24.0
lium farm ·10 hec.)	95	994 (32.6%)	225 (23.2%)	230 (23.7%)	245 (25.3%)	200 (20.6%)	52 (5.37%)	15 (1.5%)	967 (97.2%)	39.7
:ge farm) and above)	57	654 (21.4%)	105 (16.0%)	84 (12.9%)	140 (21.5%)	168 (25.7%)	120 (18.4%)	35 (5.36%)	652 (99.6%)	26.8
.al	340	3,047 (100%)	746	509	489	437	198	56	2,435	100.0%

.e:1. Percentages in the brackets (3) are the percentage to the total.
2. Percentages in the braciekts (10) are to the total family members belonging to the different categories.

)urce : Based on field survey (1993).

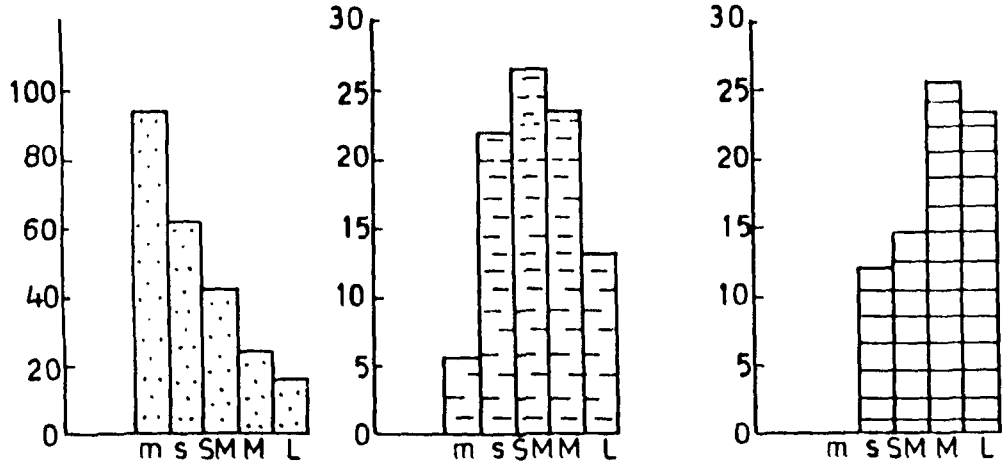
ALIGARH DISTRICT
GENERAL ASPECTS OF THE SAMPLED FARMS



m = MARGINAL
s = SMALL
SM = SEMI MEDIUM
M = MEDIUM
L = LARGE

EDUCATIONAL STATUS

PERCENTAGE



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PRIMARY
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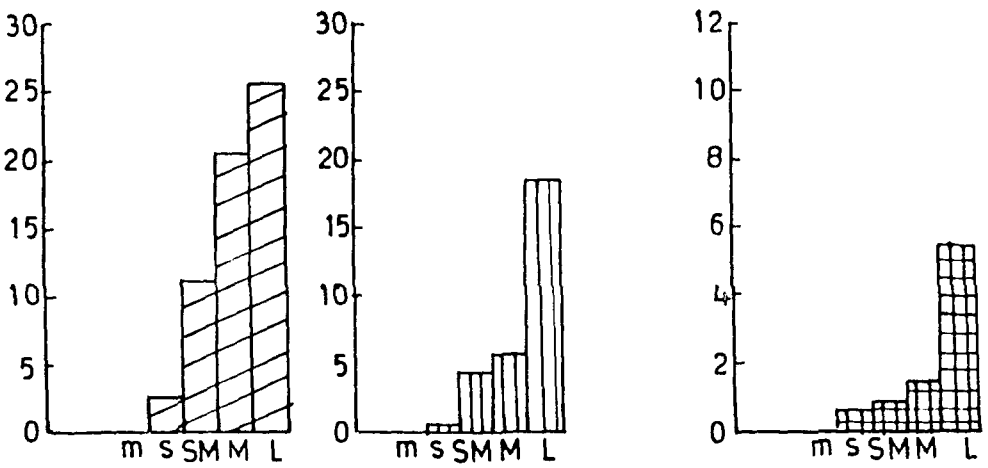


semi-medium farmers were literate. The small (6.6 percent) and the marginal (3 percent) were the least literate. Nearly 94 percent of the marginal farmers were educated only upto primary level. Nearly 62 percent of the small farmers were educated till primary level, 22 per cent till secondary, 12 per cent till high school and a very negligible per cent of the total went for more than high school. Amongst the semi-medium farmers nearly 42 per cent were educated till primary level, 26 per cent till secondary, 14 per cent till high school, 11 per cent till intermediate and a small per cent went for graduate and postgraduate level. In case of medium farmers 23 per cent till primary level education, 23 per cent secondary, 25 per cent high school, 20 per cent intermediate and a small percentage went up for graduate and post-graduate studies. Amongst the large farmers, 16 per cent were primary level, 12 per cent secondary, 21 per cent high school, 25 per cent intermediate, 18 per cent were graduate and 5 per cent were post-graduate (Figure 5.2).

5.3 AGRICULTURAL BACKGROUND OF THE SAMPLED FARMS :

Table 5.3 and figure 5.3 is showing the agricultural background of the sampled farms. It is observed that the intensity of cultivation is highest in the marginal farms (211.7 per cent) followed by small (192.9 per cent), semi medium (173.0 per cent), medium (162.2 per cent) and large farms (150,0 per cent). The average size of land holding

Table 5.3 : Agricultural Background of the sampled farms of Aligarh District (1993)

Category	Number of sampled farms	Total Area (in hec)	Average size of holdings (in hec)	Total cultivated area (in hec)	Intensity of cultivation (%)	Total family members	Family members engaged in agri-culture	Soil type and quality
1	2	3	4	5	6	7	8	9
Marginal (0-1 hec)	52 (15.29%)	42 (2.48%)	0.81	88.9	211.67	311	254 (81.67)	Sandy loam, Loamy, mostly medium and high quality.
Small (1-2 hec)	60 (17.64%)	105 (6.20%)	1.75	202.5	192.9	446	318 (71.30)	Loamy, Clayey loam, sandy loam, mostly medium quality.
Semi-medium (2-4 hec)	76 (22.35%)	250 (14.7%)	3.29	432.45	173.0	642	349 (54.36)	Loamy, sandy, loam, Medium and high quality.
Medium (4-10 hec)	95 (27.94%)	602 (35.5%)	6.33	994.55	162.2	994	450 (45.27)	Loamy, sandy, loam, mostly high quality
Large (10 and above)	57 (16.76%)	696 (41.06%)	12.21	1,044.8	150	654	187 (28.59)	Sandy, loam, clayey bhur, high and medium quality
Total	340 (100%)	1,695	4.98	2,763.2		3,047	1,558 (51%)	

Note: 1. Percentage in the brackets from No. 2 to 3 are to the total of sampled farms and total cultivated area.

2. Figures in the bracket (8) show the percentage to the total family members belonging to the different categories.

SOURCE : Base on Field Survey.

ALIGARH DISTRICT

AGRICULTURAL BACKGROUND OF THE SAMPLED FARMS

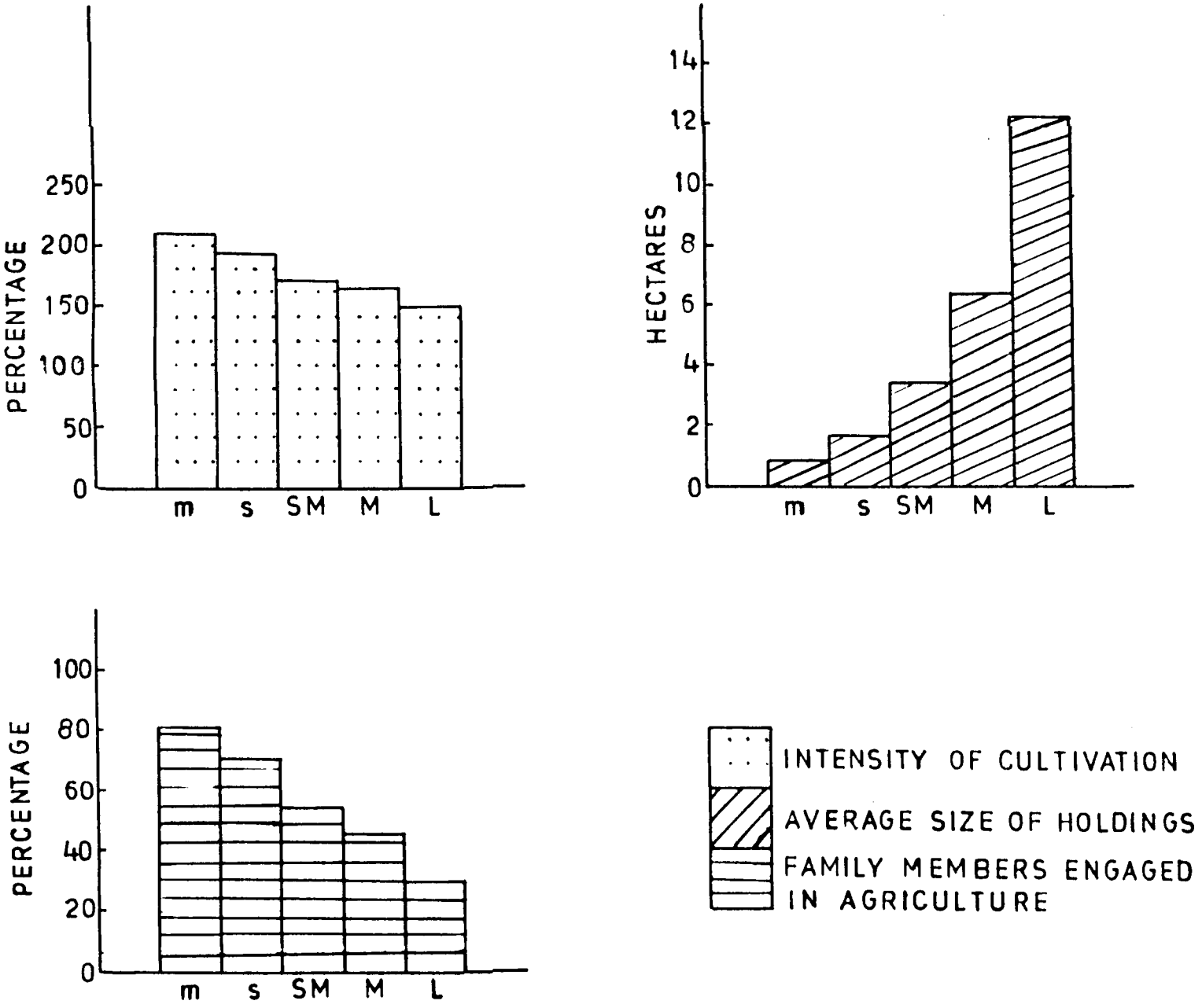


FIG. 5.3

in case of marginal farms was only 0.81 hectares while it increased upwards and the large farmers had an average size of holding of 12.21 hectares. So it was seen that as the land holding size increased, the intensity of cultivation decreased, this may be due to the fact that the marginal and small farmers wanted to get maximum returns from their small size of holdings. In case of family members employed in agricultural activities, it was observed that about 82 per cent of the marginal and 72 per cent of the small farmers were involved in it. As there was increase in land holdings, there was decrease in involvement of family members in agricultural activities. Only 29 per cent of the large farmers family members were involved in agricultural activities. Only 29 per cent of the large farmers family members were involved in agricultural activity. It was observed that as farm size, increased, there was decrease in both the intensity of cropping and involvement of family members in agricultural productions.

5.4 AGRICULTURAL INPUTS USED ON THE SAMPLED FARMS

Table 5.4 and figure 5.4 is showing the use of agricultural inputs in the sampled farms. Irrigation is done by both tube wells (private and hired, electric operated and diesel operated and state owned tube wells) and by canals. As the farm size increased, the use of private tube wells especially electric operated increased.

Table 5.4 : Use of Agricultural inputs in the sampled Farms of Aligarh District (1994)

(in percentage

Category and number of farms	Types of irrigation											
	1. Tube wells					Canal	Fertilizers		HYVS	Imple-ments	Insec-ticides and Pesti-cides	Hired Labour
	Electronic operated		Diesel		T.W. State							
	Private	Hired	Private	Hired			350 kg per hec.	175 kg per hec.				
1	2	3	4	5	6	7	8	9	10	11	12	13
Marginal 52 farms (0-1 hec)	-	60	-	40	-	-	-	40	30	12	45	-
Small 60 farms (1-2 hec)	15	50	10	25	-	-	-	95	45	20	65	30
Semi-medium 76 " (2-4 hec)	50	15	20	5	-	10	75	25	65	70	85	55
Medium 95 farms (4-10 hec)	70	-	20	-	5	5	90	10	85	82	90	75
Large 57 farms (10 and above)	95	-	5	-	-	-	100	-	92	92	100	100

Source : Based on field survey (1993)

ALIGARH DISTRICT

USE OF AGRICULTURAL INPUTS IN THE SAMPLED FARMS

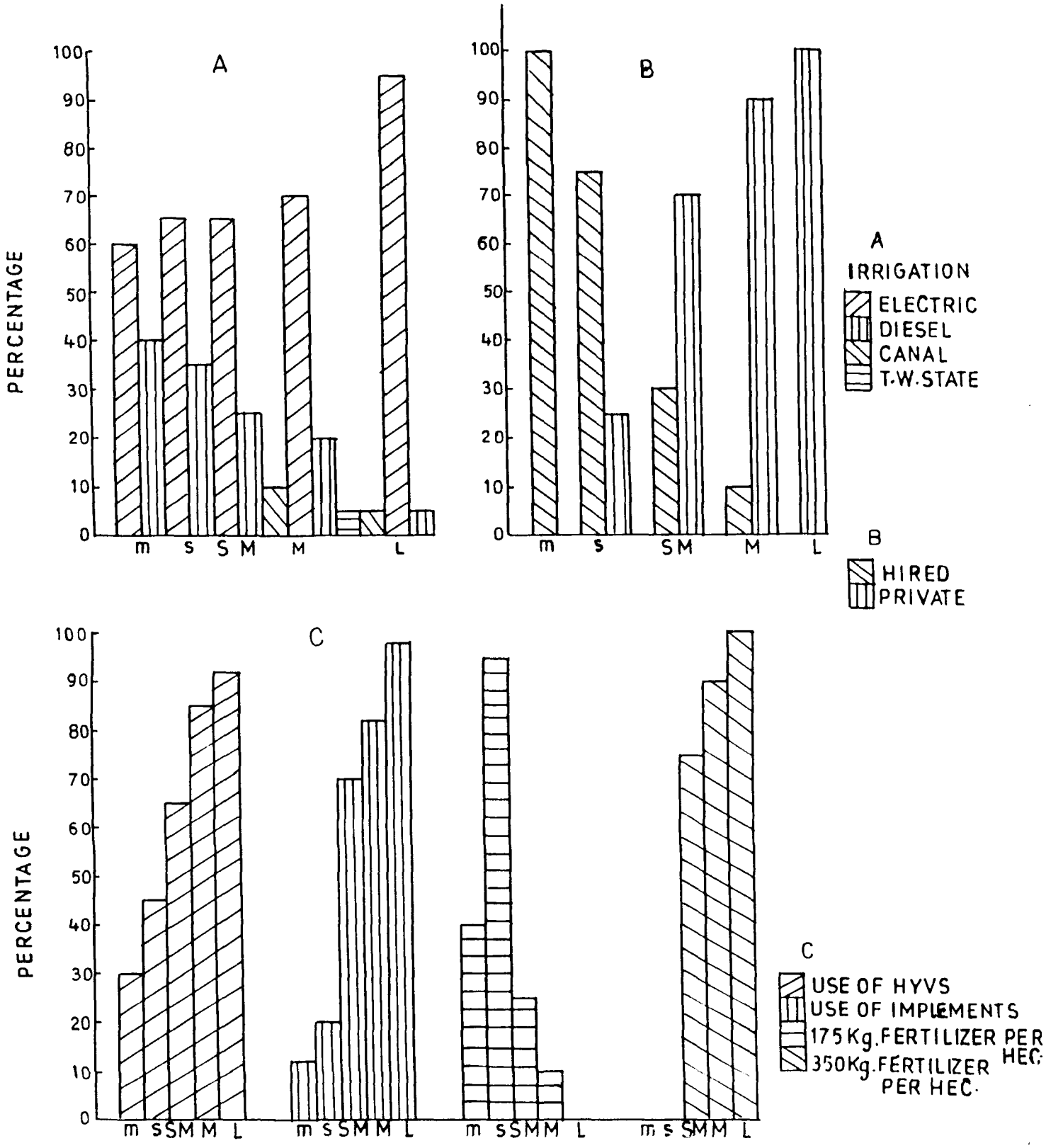


FIG. 5.4

About 95 per cent of large farms, 70 per cent of medium farmers and 50 per cent of semi-medium farmers irrigate their fields from electric operated private owned tube wells. This shows that the large and medium farmers install their own tube wells and have the water in their own hands. While the semi-medium, small and marginal farmers irrigate their fields from hired water. Regarding the use of other inputs like chemical fertilizers, high yielding varieties of seeds, agricultural implements, insecticides and pesticides, and hired labour-it was observed that as the farm size increased the use of these inputs also increased. The large and medium farmers used the highest amount of inputs. This shows their affluence, educational status, political power and measures to technical knowhow. While the marginal and small farmers who belong to the economically backward section of the society and are poor, they can not afford to buy all these inputs. They are soundly backward and economically poor and this is the reason as to why they cannot use these inputs.

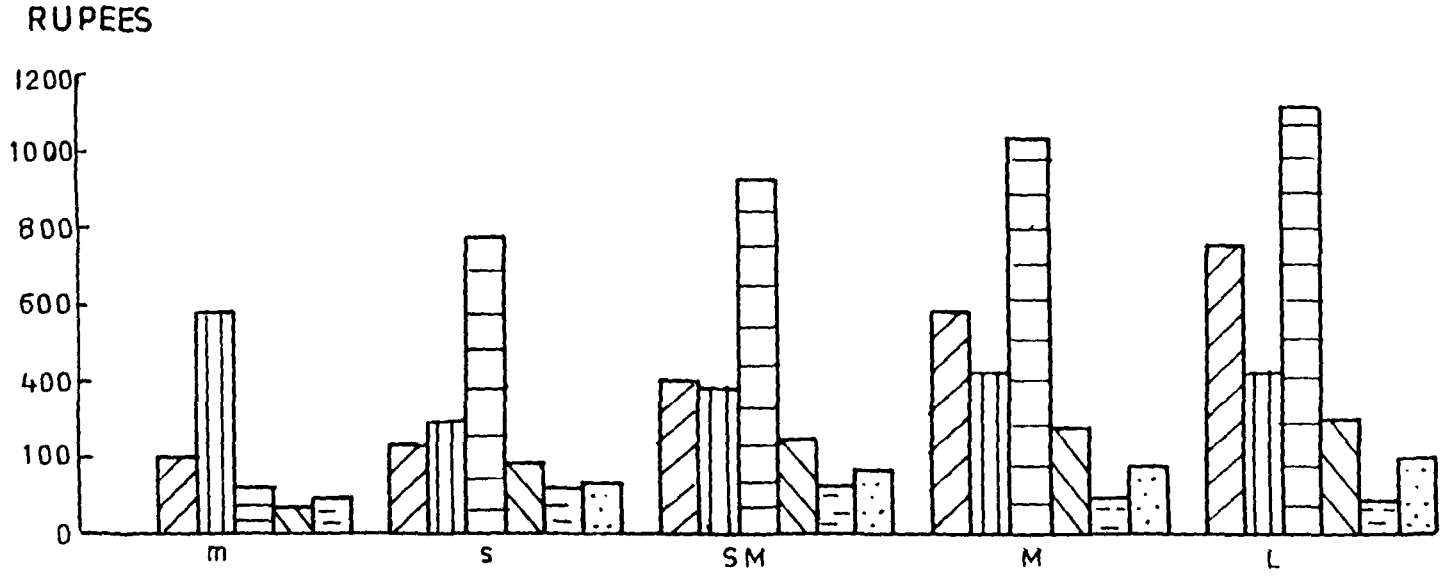
Table 5.5 and figure 5.5 is showing the cost of agricultural inputs used in the sampled farms. It is seen that the total cost of agricultural inputs increased as the size of holding increased. The large farmers were paying the highest (Rs. 4,297 per hectare) for inputs followed by medium (Rs. 4,262 per hectare), semi-medium (Rs. 3,892 per hectare), small (Rs. 3,329 per hectare) and marginal

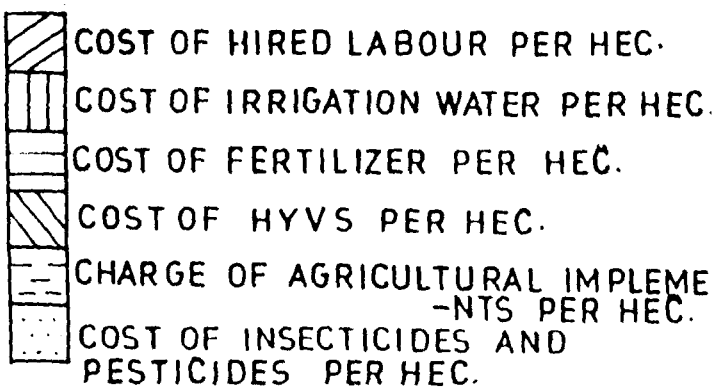
Table 5.5 : Cost of agricultural inputs of Sampled Farms in Aligarh District (1993)

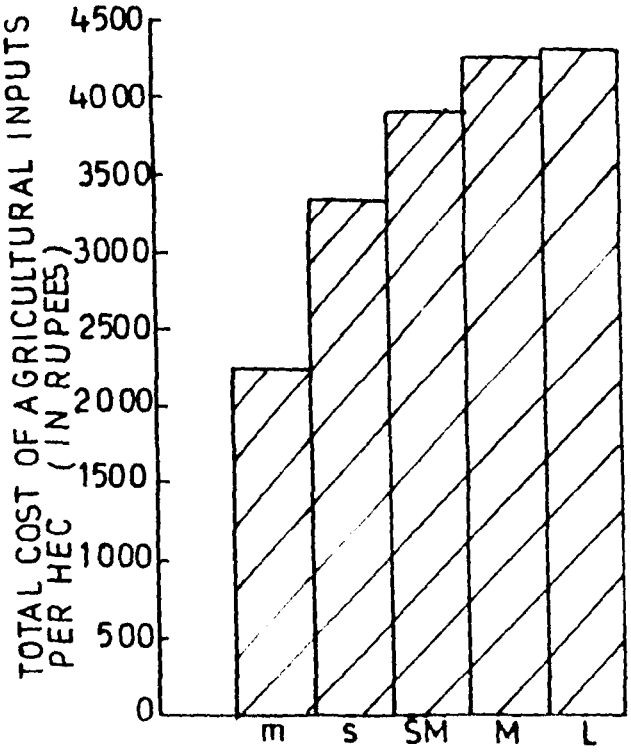
Category	Cost of hired labour per hectare (in Rs.)	Cost of irrigation water per hectare (in Rs.)	Cost of fertilizer per hectare (in Rs.)	Cost of HYVS per hectare (in Rs.)	Charge of agricultural implements per hec. (in Rs.)	Cost of insecticides and pesticides per hec. (in Rs.)	Total cost of agricultural inputs per hectare (in Rs.)	Rank
1	2	3	4	5	6	7	8	9
Marginal	-	200	570	125	70	90	1,055 x 2.12 = 2,236.6	5
Small	230	290	770	185	120	130	1,725 x 1.93 = 3,329.25	4
Semi-medium	400	375	925	250	130	170	2,250 x 1.73 = 3,892.5	3
Medium	575	425	1,030	280	90	180	2,580 x 1.652 = 4,262	2
Large	750	415	1,110	300	90	200	2,865 x 1.5 = 4,297.5	1

Source : Based on field survey (1993).

ALIGARH DISTRICT
COST OF AGRICULTURAL INPUTS USED IN THE SAMPLED FARMS







(Rs. 2,236 per hectares). Thus, it is again seen that the large and medium farmers were paying the highest cost. As the farm size increases the cost of inputs has also increased. This is because they are adequately applying inputs in their fields.

5.5 AGRICULTURAL PRODUCTION IN THE SAMPLED FARMS :

Table 5.6 and figure 5.6 is showing the farm size yield per hectare, total production, average price per quintal, total value of output and per hectate value in the sampled farms. In this table the total production and monetary value of total crop production in each category was computed. It was observed that the large farms got the maximum total returns for agricultural production (Rs. 14,666,390.4), followed by medium (Rs. 14,441,015), semi-medium (Rs. 6,002,924.9), small (Rs. 2,118,376.8) and marginal (Rs. 0,786,057.7) farms.

The large farmers grow more remunerative crops like sugarcane, wheat, potato and getting high price than other categories of farms. But increase of farm size value of output per hectate was highest in the category of medium farms (Rs. 14,520), followed by large farms (Rs. 14,037) semi-medium (Rs. 13,881), small (Rs. 10,461) and marginal (Rs. 8,842) farms. The small and marginal farmers got the least values, again this shows their poor economic conditions. They don't have the money to invest in inputs.

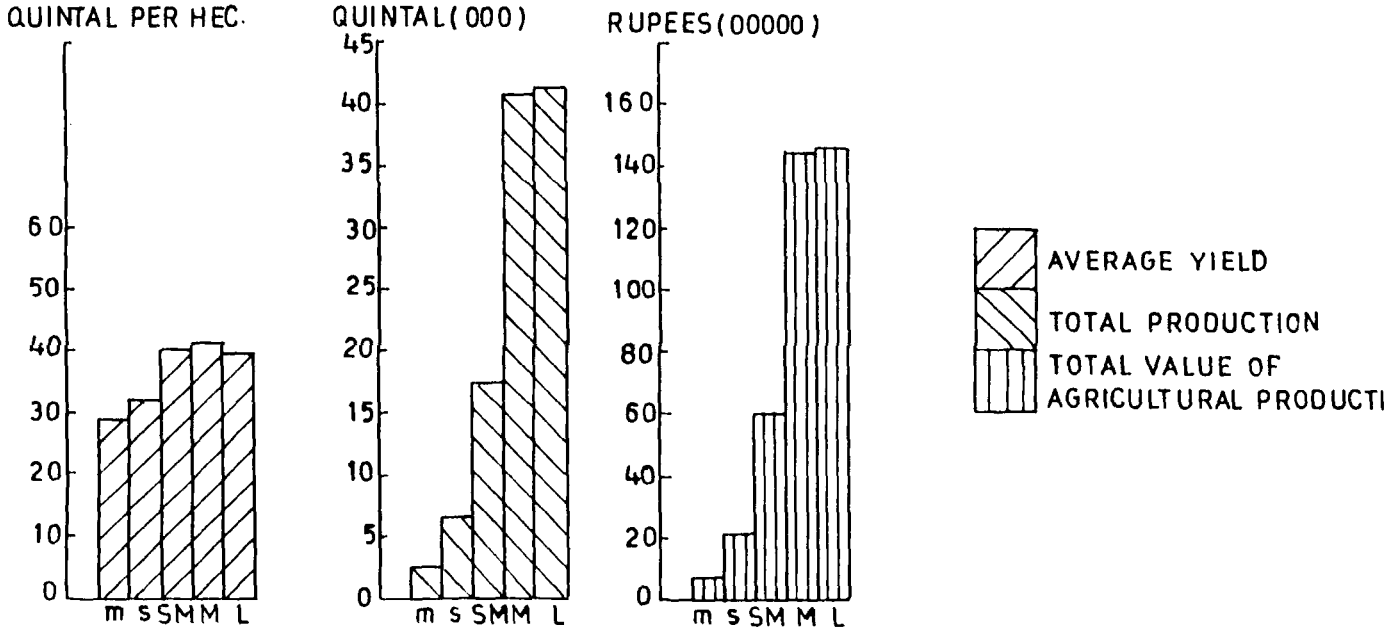
Table 5.6 : Farm size and yield per hectare and value of output per hectare in the sampled farms of Aligarh district (1993).

ıtegory and ımber of ırms	total holdings (in hec)	Total pperated area (in hec)	Average yield (qu/hec)	Total production (in quintal)	Average price per quintal	Total value of agricultural Production (in Rs.)	Rank	Farm size value of output per hectare (in Rs.	Rank
1	2	3	4	5	6	7	8	9	10
ırginal 12 farms)	42.0	88.9	28.4	2,524.76	311.34	0,786,058.77	5	786,058÷88.8 = 8,842	5
ıall 10 farms)	105.0	202.5	32.0	6,480.00	326.91	2,118,376.8	4	2,118,376.8÷202.5 = 10,461	4
mi-medium 16 farms)	250.0	432.45	40.0	17,298.00	347.03	6,002,924.9	3	6,002,925÷432.45 = 13,887	3
dium 15 farms)	602.0	994.55	41.0	40,776.55	354.15	14,551,015.0	2	14,441,015÷994.55 = 14,520	1
rge 7 farms)	696.0	1,044.8	39.5	41,269.60	355.38	14,666,390.4	1	14,666,390÷1044.8 = 14,037	2

Source : Field survey (1993)

ALIGARH DISTRICT

FARM SIZE VALUE OF OUTPUT PER HECTARE IN THE SAMPLED FARMS



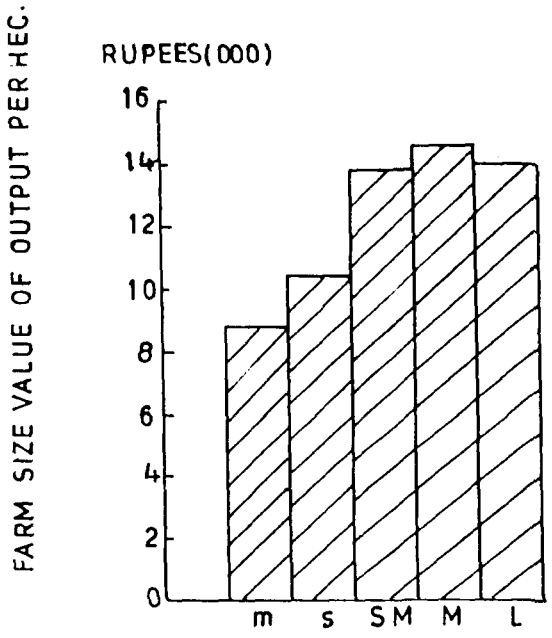


FIG. 5.6

Inspite of high intensity of these farms, the use of irrigation, H.Y.V. seeds, fertilizers is less, so the yield is poor and production is less on these farms.

5.6 RELATIONSHIP BETWEEN LANDHOLDINGS AND AGRICULTURAL PRODUCTIVITY IN THE SAMPLED FARMS :

In this section an attempt has been made to examine the relationship between land holding and agricultural productivity with the help of qualitative method and least square fitting method. In order to establish a relationship. Cost of agricultural inputs per hectare and farm size value of output per hectare in terms of Rupees were calculated by qualitative method and is presented in table 5.7 and figure 5.7. The results indicate that there is no inverse relationship between land holdings and agricultural productivity in the study area. Maximum profit is attained by the medium farmers (Rs. 10,258.3 per hectare) followed by semi-medium (Rs. 9,988.5 per hectare) large farms (Rs. 9739.9 per hectare), small farms (Rs. 7,131.95 per hectare) and marginal farms (Rs. 6,605.5 per hectare).

Again a relationship between land holding and agricultural productivity is examined with the help of least square fitting method. In this regard trend of the difference of price of yield versus size of holding was determined by least square fitting method (Table 5.8). It is seen that there is a little impact of landholdings

Table 5.7 : Relationship between landholdings and agricultural productivity in the sampled farms of Aligarh District (1993) (By qualitative method)

Category	Total area (in hec)	Total cultivated area (in hec)	Cost of agricultural input per hectare (in Rs.)	Farm size value of output per hectare (in Rs.)	Profit per hect (in Rs.)	Rank
1	2	3	4	5	6	7
Marginal farming (0-1 ha)	42.0	88.9	2,236.6	8,842	6,605.4	5
Small farms (1-2 ha)	105.0	202.5	3,329.25	10,461.2	7,131.95	4
Semi-medium farms (2-4 ha)	250.0	432.45	3,892.5	13,881	9,988.5	2
Medium farms (4-10 ha)	602.0	994.55	4,262	14,520.3	10,258.3	1
Large Farms (10 and above)	696.0	1,044.8	4,297	14,037.4	9,739.9	3

Source : Based on field survey (1993).

ALIGARH DISTRICT

RELATIONSHIP BETWEEN LANDHOLDINGS AND AGRICULTURAL PRODUCTIVITY IN THE SAMPLED FARMS.

FIG. 5.7

Table 5.8 : Relationship between landholdings and agricultural Productivity in the Sampled Farms of Aligarh District (1993).

Category	x	y	xy	x^2
Marginal	0.80	6605	5284	0.64
Small	1.75	7132	12481	3.06
Semi-Medium	3.29	9988	32860	10.82
Medium	6.33	10258	64933	40.07
Large	12.20	9740	118828	148.84
	n=24.37	y=43723	xy=234386	x^2=203.43

Where,

x = Size of landholdings (in hec.)

y = Annual profit per hectare (in Rs.)

$$y = 5a + b\,x \qquad \ldots. (1)$$

$$xy = a\,x + b\,x^2 \qquad \ldots.(ii)$$

or $43,723 = 5a + b\,(24.37)$ ....(iii) x (24.7)

$234,386 = a(24.37) + b(203.43)$ ....(iv) x (5)

$1,065,529 = (5 \times 24.37)\,a + b\,(593.9)$

$1,171,930 = (5x24.37)\,a + b\,(1,017.15)$

$106401 = b\,(423.25)$

or $b = 251.4$

Now putting the value of b in eq.(iii)

we get

$43.723 = 5a + 251.4\,(24.37)$

Contd....5.8 table

$$43,723 = 5a + 6126.6$$

$$5a = 43,723 - 6126.6$$

$$5a = 37,596.4$$

$$a = 7519.28$$

$$= 7519$$

$$a = 7519$$

$$b = 251.4$$

$$y = a + bx$$

$$= 7519 + 251.4\ x$$

Now	x = 0	1	2	3	4	5
y =	7519	7770.4	8021.8	8273.2	8524.6	8776
Rank	6	5	4	3	2	1

TREND LINE OF LANDHOLDINGS AND AGRICULTURAL PRODUCTIVIT

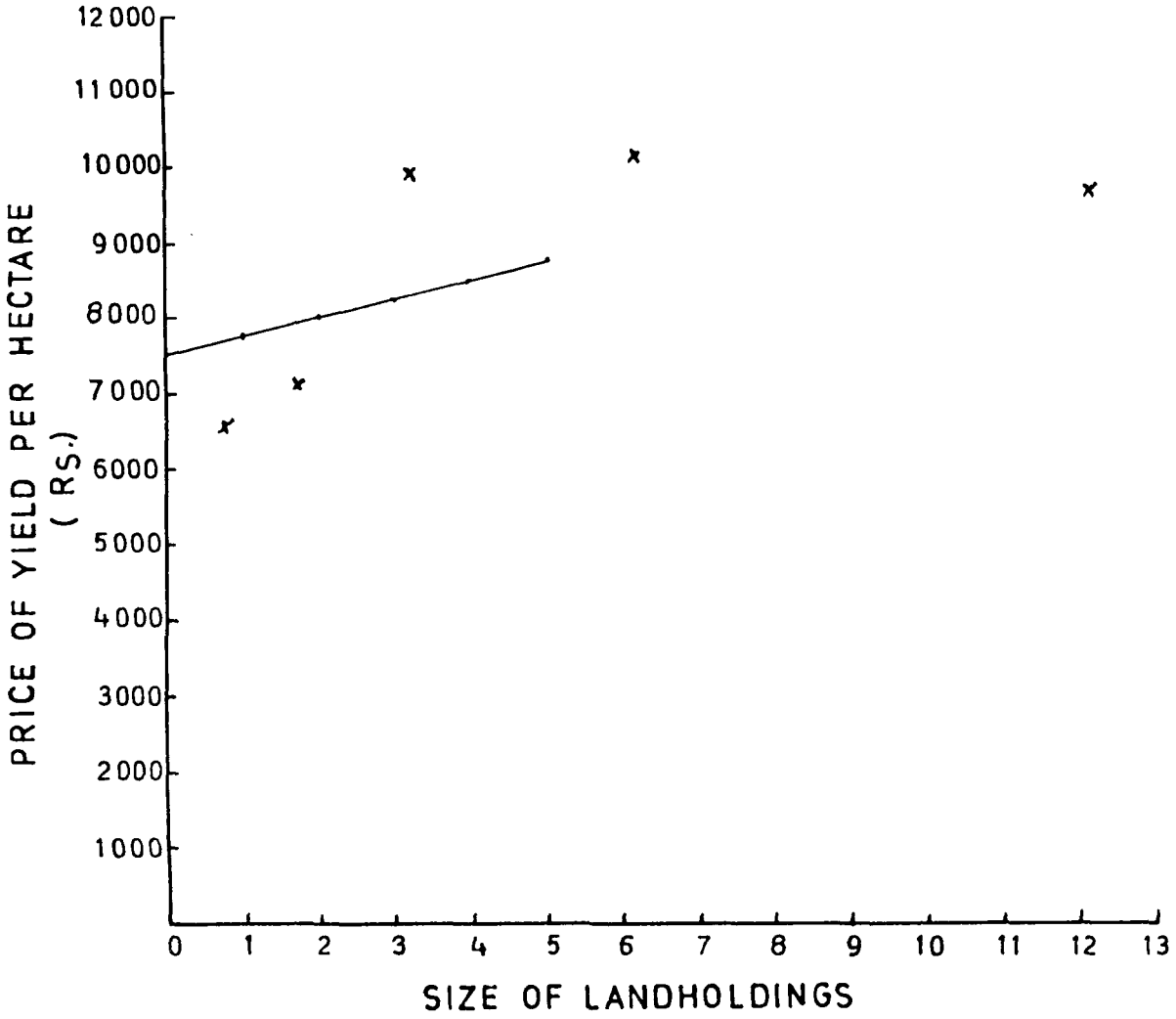


FIG. 5·8

on farm productivity. In other words, there is a positive relationship between land holdings and productivity. Actually least square fitting method gives an average relationship between land holdings and agricultural productivity. In this case large farmers are getting maximum profit (Rs. 8,776 per hectare), followed by medium farms (Rs. 8,524.6), semi-medium (Rs. 8,273.2), small (Rs. 8,021.8) and marginal farms (Rs. 7770.4).

C O N C L U S I O N

C O N C L U S I O N

The size of land holding generally refers as the size of holding under one ownership. Landholdings are of three types viz. operational holdings, economic holdings and optimum holdings. The size of landholdings is generally measured on the basis of acre or hectare.There are many causes for the small size of landholdings such as rapid population growth, law of inheritance, attachment to landed property, decline of joint family system, etc.The average size of holding in India is about 1.70 hectares. This small size is hinderance for agricultural development. It is also impossible to use modern agricultural implements, to turn even a pair of bullock carts on the tiny land becomes impossible. The small and marginal farmers have continued with their subsistence type of farming and have ultimately become farm labourers or migrated to urban areas in search of better employment.

Agricultural productivity plays a very important role in the economic development of any region. Agricultural productivit simply means yield per unit area or ratio between the index of total output and index of total input with reference to farm or crop production. It is analysed from three angles viz. Land productivity, Labour productivity and capital productivity As far as measurement of agricultural productivity is concenned, there is no generalized method. So some of the important

approaches have been discussed in brief.The agricultural productivity in India is very less than other countries. This is due to lack of moisture, uncertainty of rainfall, economic and institutional factors, price incentive structure of landholdings etc. The lopsided structure of landholdings is said to be one of the major causes of law productivity in India. Many views regarding relationship between landholdings and agricultural productivity have been traced out in the context of the present study.some studies revealed inverse relationship while others argued that as the farm size increased, productivity also increases.

Aligarh district was chosen as the study area because this is one of the agriculturally advanced and prosperous districts of Uttar Pradesh.Technology was ushered here from early sixties. In the mid-fifties, the cultivation method was primitive in the villages, investment of capital in agricultural innovation was the lowest,farmers mostly used local seeds which resulted in poor yields. High yielding varieties of seeds were not available. The use of insecticides and pesticides were little and the farmers were mostly illiterate. During that perio small and marginal farmers were getting maximum returns as compared to large, medium and semi-medium farmers because small and marginal farmers could put in more family labour whereas large medium and semi-medium farmers had to depend on hired labour which was costly. Owing to cheap family labour,

the small and marginal farmers were cultivating a large portion of their lands and used more manures - resulting in higher intensity of cultivation, whereas the large, medium and semi-medium farmers used highly paid hired labour. Consequently, intensity of cultivation was lower.

With the adoption of new technology from mid-sixties onwards, the agricultural scenario has changed in Aligarh district.The results of the study of 340 farms of Aligarh district shows that :

1. The ushering of technologicalinnovations,proper supervison and management are responsible for the disappearing or weakening of the inverse relationship between landholdings and agricultural productivity which was found under labour intensive technology.

2. The calculation of average cost of agricultural inputs per hectare and farmsize value of output per hectare clearly indicates that the medium sized farms (Rs.10,258.4 per hec) are getting the maximum profit followed by seim-medium sized farms (Rs.9,988.5 per hectare).This is because these farmers work very hard on their fields. The intensity of cultivation (173% and 162%) is also high and they use adequate amount of inputs. There is no labour problem as they themselves work on their fields. They are

educated and so they apply the technology scientifically and they are aware of new innovations.

3. Even with the adoption of new technology in this district large farmers could not get maximum profit (Rs.9,739.9 per hectare). This has mainly because of lack of proper supervision and management. They were also facing problems of hired labour. The intensity of cultivation on these farms (150%) was also low. But the value of output per hectare of large farm is higher than small and marginal farms because they prefer growing remunerative crops like sugarcane, mustard, pulses etc.

4. The value of output per hectare on the small sized farm is slightly higher (Rs. 7,131.95 per hec) than marginal farms (Rs. 6,605.4 per hec) because of utilization of irrigational and HYVS facilities.

The present situation is due to the adoption of new technology. Theuse of agricultural inputs like irrigation, fertilizers, HYVS, modern agricultural tools, insecticides and pesticides and other qualitative aspects like education and skills - all these helped the large, medium and semi-medium farmers to increase their profits. It is seen that small and marginal farmers were using less amount of agricultural inputs and getting lower profits.

Inspite of having more technological facilities large farmers did not achieve maximum output per hectare than medium-sized and semi-medium sized farms because of lack of proper supervision, management and control of big farms. The other important reasons are uncertainty of hired labour during sowing period. Besides these, family quarrels, land disputes migration to urban areas by family members, heavy reliance on labour etc, resulted in low returns. The large farmers were getting more output (in terms of Rupees) per hectare than small and marginal farmers because of greater use of agricultural inputs. Medium and semi-medium farmers were getting the advantage of new technology and proper supervision in their fields. The intensity of cultivation on large, medium and semi-medium farms were 150, 162 and 173 percent respectively. Thus, in case of medium and semi-medium farms - intensive land utilization with the help of new technology has led to achieving maximum output per hectare. They also had better access to credit, better access to information, education, skills all these contributed in maximization of agricultural productivity.

The intensity of cropping in small and marginal farms were 193 and 212 percent respectively but they used lowest amount of agricultural inputs because of lack of money and this ultimately resulted in low output per hectare. The other causes were lack of technical know-how, education and skill

They did not have their own tubewells. They had to pay high charges (Rs. 12 to 15 per hour) for hired water and they could not rely on canal water as its supply was not timely. As a result, small and marginal farmers were able to use a little amount of fertilizers and high yielding varieties of seeds. Hence, output per hectare (in terms of Rupees) was low on these farms and the profits were also low.

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